SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXVII.—No. 15. [NEW SERIES.] NEW YORK, OCTOBER 13, 1877. [$3.20 per Annum. [POSTAGE PREPAID.]

Aniline Dyes.

There has been at various times much discussion on what may be termed the sanitary aspect of the aniline dyes. Although it may be at first difficult to see in what way the color of an article of costume can possible affect health, yet the relation of the one to the other is not so remote as might be anticipated. Socks, stockings, and gloves are worn next the skin, and poisonous matters may thus be brought into the system; even the very wear and tear of ordinary costume, in the event of the color not being of a very firmly adherent nature, results in a portion of coloring matter being liberated in the form of a fine dust, and thus inhaled by the lungs. In France, stringent measures have had to be adopted to prevent the artificial coloration of cheap wines with "fuchsine." Recent experiments have now beyond doubt established that aniline dyes, at least, the reds and blues, are in their pure condition comparatively inert, and that the ill effects which have been sometimes attributed to the use of these dyes are traceable, not to the pure coloring matters themselves, but to traces of arsenic which they contained, and which arose from inefficient purification subse quent to manufacture. Enterprising scientists may always be found who are willing to become martyrs, for science or for notoriety, and the present inquiry has had its self-sacrificing hero in the form of Herr Seidler, of Riga, who administered to himself three quarters of a grain of aniline red every morning, for a period of five weeks, without any ill effects. When it is pointed out that a single grain of aniline red is said to be sufficient to impart a good pink color to fifteen gallons of alcohol, it would be necessary to drink an enormous quantity of artificially colored wine in order to equal a single morning performance of Herr Seidler. So far the question is practically settled, the only remaining difficulty being our inability to ascertain whether pure or impure coloring material has been used in any purchased article; and it will therefore be better, as a simple matter of precaution, to be on our guard against the indiscriminate use of aniline dyes for coloring purposes.—*Medical Examiner.*

THE MANUFACTURE OF WALL PAPER.

The use of paper as a covering for walls originated in China. It was introduced in Europe as a substitute for tapestry hangings—whence the term paper hangings—by the French. At the present time, owing to the improvements which have been effected in printing, and the wide range of colors open to the artist designer, it offers probably the cheapest and most ornate means of mural decoration.

The blank paper is received by the manufacturer in the long rolls made by the Fourdinier machine, and weighing from 80 to 85 lbs. to the roll. It varies in quality according to the printing and finishing which it is to receive—weighing 9, 10, 12, and 14 ounces to the length of eight yards, which constitutes the usual length of the roll as sold at retail. The first process undergone is termed

"GROUNDING,"

and the object is to give the paper the requisite body to enable it to receive the colored pattern. The grounding machine is represented in Fig. 1. While passing over a roller the paper is covered with a mixture of so-called Jersey clay, which contains some 18 per cent of alumina, glue, and water, and if the surface is to be finally polished—or satin finished—a percentage of lard oil is added. After the mixture is applied it is evenly distributed over the paper, first by two reciprocating brushes, then by a rotating brush roller, and lastly by two brushes like the first. It then is conducted up between endless belts across which sticks are laid, and over which sticks the paper is suspended in festoons. The sticks are so placed that a length of paper measuring just four yards hangs between any two. The belts are kept in constant motion, and the paper is thus conducted along the loft, which measures some 160 feet in length. Steam coils are placed beneath the belts, and a temperature of 120° maintained. About nine minutes are occupied by any one festoon of paper in making the journey from grounding machine to the point where it is again made into a roll, and during this period it becomes thoroughly dried. Frequently coloring matter is mixed with the ground paint, and the paper is thus given a flat tint, which forms a background for the pattern, or which is left unaltered when the paper is meant to be perfectly plain and to resemble paint or kalsomine when attached to the wall.

IMPRINTING THE PATTERN BY BLOCKS

is done in two ways, either by the block or old process, or by the roller or improved process. In either case each color entering into the design must be printed separately,

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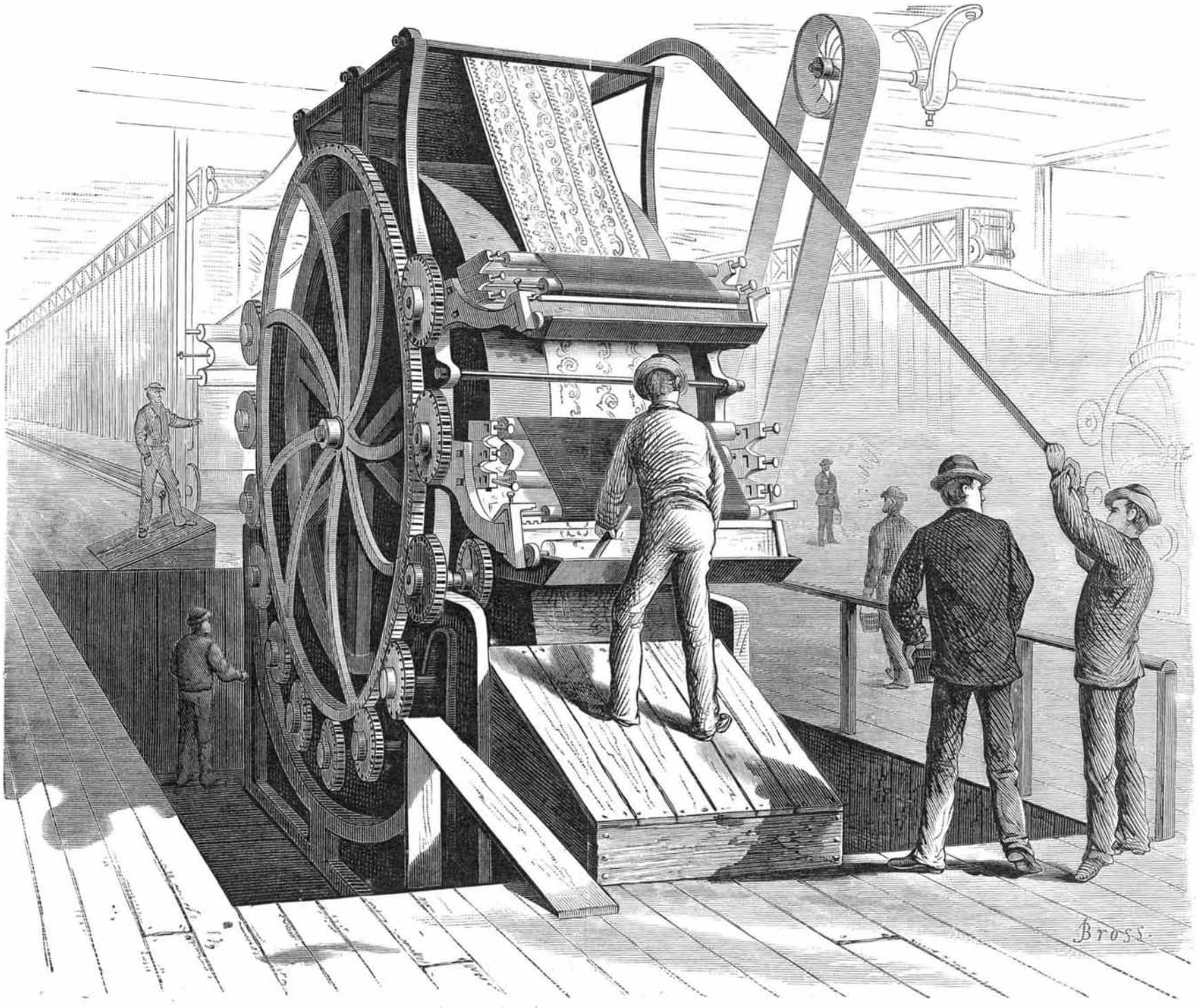

THE MANUFACTURE OF WALL PAPER.—THE PRINTING MACHINE.

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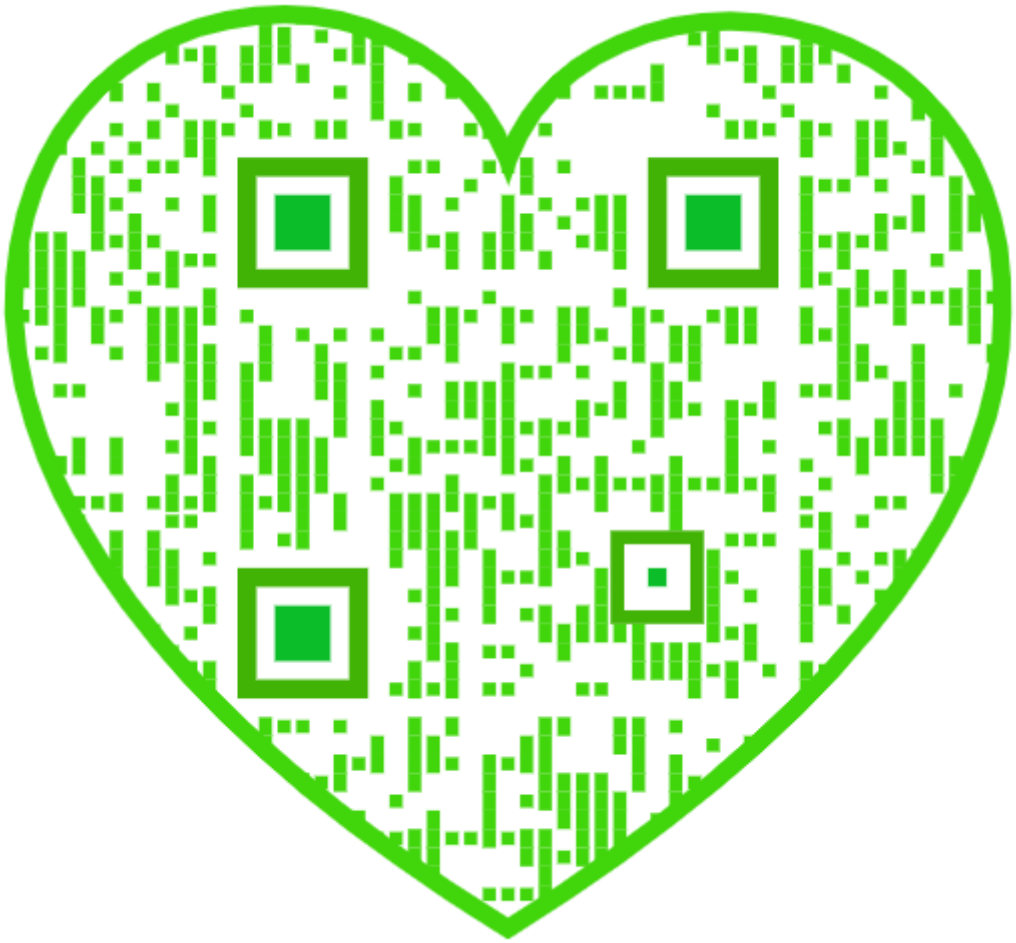

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XXXVII., No. 15. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, OCTOBER 13, 1877.

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Measurement of Height of Clouds. By A. MALLOCK. Read before the British Association. 3 engravings.

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THE FIRE IN THE U. S. PATENT OFFICE.

On the morning of September 24, a fire broke out in one of the attic model rooms of the Patent Office, in Washington, which destroyed part of the upper portion of the west and north wings of the building. It is not known how the fire originated, but spontaneous combustion among patented chemicals in the upper part of the building is assigned as a probable cause. The edifice above the third story was filled with printed documents and models, the latter made of light inflammable wood. The roof was also of wood. The fire, therefore, had abundant material whereon to feed, and made rapid headway.

It is gratifying, however, to know that all the lower portion of the building, which is fireproof, and in which the active affairs of the Patent Office are conducted, escaped permanent injury. None of the original patent documents were lost: all drawings, specifications, files, etc., remain intact, together with all caveats, assignments, and pending applications for patents. Consequently there will be no interruption of business.

The fire merely swept away a portion of the upper works of the edifice, and, perhaps not unfortunately, destroyed a great accumulation of rubbish. The re-roofing will be rapidly pushed forward, and it probably will be so carried out as to render the business facilities of the Office better than before the fire.

LEVERRIER AND HIS WORK.

In the death of Leverrier the world loses its most eminent astronomer; but unlike many great disciples of science, he bequeaths to posterity not unfinished work which none but a master mind equal to his own could complete, but the record of undertakings carried to successful endings, and together aggregating the noblest astronomical achievement ever accomplished.

Urbain Jean Joseph Leverrier was born at St. Lo, in the old Department of Normandy, France, on March 11, 1811. He was a close student and obtained honors in the Polytechnic School, which entitled him to a choice of employment in any of the select branches of the public service he might desire. Choosing the position of engineer attached to the administration of the government tobacco monopoly, in order that he might possess the necessary facilities for the continuation of his studies, his attention was first directed to chemical experimentation, and in 1837 he published his first original investigations, announcing a new combination of phosphorus and oxygen. His preference, however, was for mathematics, and in 1839 he began the colossal astronomical task, the termination of which he himself announced to the French Academy of Sciences on December 21, 1874.

In order to reach a just estimate of this vast work, it is necessary to recall the fact that in the solar system the mass of the sun is so great that that luminary is capable of swaying the motion of all the planets without being himself disturbed. Although the planets exert an attractive power on the sun, still if their joint attraction were exercised upon him in a straight line, he would not be disturbed by a space equal to his own radius. So vast then is the controlling power of the sun that even the greatest disturbance in the entire system (that resulting from the mutual attraction of Jupiter and Saturn) is inconsiderably small in comparison. But the fact still remains that the planets do disturb each other in varying degrees, and the more massive the planet the greater its influence upon its neighbors. Consequently and conversely, if we know how much one planet disturbs another, we have a means of determining the mass of the influencing body.

This determination was the object of Leverrier's inquiry, and he set to work to examine into the motions of the seven planets known at the period when his labors began. It is scarcely possible for any one, not conversant with the delicate and intricate toil of the astronomer, to appreciate the multitudinous perturbing causes which in such an investigation it becomes necessary to take into account. Some idea may, however, be gained from the fact that in determining the earth's motion around the sun—but one part of his subject—Leverrier reviewed and discussed nine thousand distinct observations. "Our conclusion is," he says, referring to these, "that the observations of the sun leave much to be desired, on account of systematic errors affecting them; and there is no discordance between theory and observation which cannot be attributed to errors in observing."

Still, from these imperfect data, he estimated the sun's apparent monthly displacements and deduced therefrom an estimate of the distance of the sun, showing that the generally accepted figures were too large by between three and four millions of miles.

Meanwhile, by a most careful analysis of all available observations of Uranus, Leverrier had satisfied himself that that planet was undergoing disturbance by some unknown body. He was in the position, to borrow Professor Proctor's illustration, of an observer who, traveling (say) along a canal, should observe "that certain waves, which had long been of a particular size, began to grow larger. Suppose that, struck by this, he instituted a careful series of measurements of their size, and at last satisfied himself that they had increased. . . If, however, while he had satisfied himself by his wave measurements that the waves had really increased in size, he had also satisfied himself that during his observations the increase had reached its full extent, and had even begun to give place to a slow decrease, tending to restore the original size of the waves, he would manifestly have here an indication which might serve to tell him of the very spot where the disturbance had taken place." Something of this kind had happened in the case of Neptune; and when Leverrier's analysis of the motion of Uranus was finished, it was seen that the displacement had reached its maximum and was beginning slowly to decrease. In order to produce these perceptible effects—and many years were occupied in their production, for it is now known that Uranus only completes his circuit in 84 years, while Neptune requires 164 years—Leverrier assumed that another planet must exist; and from the observed perturbations of Uranus, he calculated the orbit and position of the unknown world. On the 1st of January, 1847, six months after Leverrier had completed the calculations, the planet was found within two degrees of where Leverrier predicted it would appear on that date.

We pass over the long discussion among astronomers as to whether Leverrier or the English observer Adams was the true discoverer of Neptune; both overcame enormous mathematical difficulties, but whether Adams first conceived the existence of Neptune or not, Leverrier certainly earliest made known the discovery to the world.

The quite recent supposed discovery of an inter-Mercurial planet, which afterwards proved to be a sun spot, brought M. Leverrier's investigations into the motions of Mercury prominently forward. He long ago determined that the movements of Mercury, as observed, did not accord with those calculated. "This result," he says, "naturally filled us with inquietude. . . Long years passed, and it was only in 1859 that we succeeded in unraveling the cause of the peculiarities recognized." There exists, he states, in the neighborhood of Mercury, doubtless between that planet and the sun, some matter as yet undiscovered; but whether it consists of one or more small planets or other more minute asteroids, or even of cosmical dust, he does not positively assert. The present opinion is that the meteoric and cometic matter existing in the sun's neighborhood in enormous quantities, produces the perturbations of Mercury; but Leverrier clung to the belief in Vulcan, and manifested the most intense interest in every alleged discovery of that planet. When Lescarbault believed that he had found the inter-Mercurial world, Leverrier was one of the first to abruptly present himself and to demand how the discoverer had dared "to commit the grave offence of keeping your observation secret for nine months. I warn you," he continued, "that I have come here with the intention of doing justice to your pretensions;" and then he examined Lescarbault's primitive apparatus, cross-questioned him sharply, and finally departed, overwhelming the supposed discoverer with his congratulations. How Liais upset this discovery by showing the imaginary Vulcan to be a sun spot is well known; and a repetition of similar experience recently is said to have left the great astronomer disappointed and unhappy.

Leverrier's examination of the motions of Venus resulted in tables of wonderful accuracy. His study of the motions of Mars revealed the influence on that planet of the asteroid zone. Summing up his work, Professor Proctor says: "Beyond question he has deduced from the observed motions of the planets all that at present can be deduced as to the masses of the different known and unknown parts of that complex system which occupies the space ruled over by the sun."

In 1853, M. Leverrier became Director of the Observatory in Paris, which post he occupied until 1870, when he resigned, but in 1872 he resumed its duties, which he has since continued. He took the greatest interest in the large telescope recently erected at the observatory. "It comes none too soon," he replied coldly, when congratulated on its completion; and he at once set to work, hoping by its aid to settle the question of the inter-Mercurial planet. His labors were severe, his rest constantly broken. The task was too much for a man sixty-six years of age, whose life had been one of incessant toil, and he sank under it. His death occurred on September 23d.

MODELS DESTROYED BY THE PATENT OFFICE FIRE.

The Superintendent of Models at the Patent Office gives the number of patented models destroyed as about 87,000. To these should be added the postponed and rejected cases, say about 49,000, making in all about 136,000. The following list will give a pretty accurate idea of the classes destroyed:

Class 1. *Aeration and Bottling.* Aerated liquor apparatus and processes, soda fountains, fire extinguishers, barrel-filling, bungs and vents, bottling, bottle stoppers and washers.

Class 4. *Baths and Closets.* Includes baths, water and earth closets, urinals, washstands and basins, sinks, stench traps, water closet appliances, and water traps.

Class 6. *Beehives.* Includes apiaries, bee feeders, fumigators, honey boxes, moth traps, and swarm indicators.

Class 10. *Bolts, Nuts, Rivets, and Washers.* Consists of varieties of the articles and machines for making them. Of this class the following were saved: Nutlocks, taps, dies, and plates for screw and nut making; but all machines for making these articles were destroyed.

Class 13. *Brakes and Gins.* Machinery for the treatment of raw cotton, flax, and hemp; hair and oakum pickers, and husk splitters.

Class 14. *Bridges.* Includes everything connected with bridges and arches, their piers and abutments, trusses and

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girders for bridges, floors, and roofs, iron trusses, piers, and columns.

Class 15. *Brushes and Brooms.* Includes everything connected with brooms, brushes, mats, mops, and machines for making them.

Class 17. *Butchering.* All relating to slaughtering and skinning animals, dressing their carcasses, cutting meat, sausage making, catching animals for slaughtering, hair cleaning, and brine tubs.

Class 20. *Carpentry.* Includes all the woodwork of houses (except trusses and girders), iron laths, wood laths, and machines for nailing them, scaffolds for building, ladders, fire escapes, wood and metallic blinds.

Class. 21. *Carriages and Wagons.* All relating to the construction of wheeled vehicles, sleighs, trucks, barrows, velocipedes, and their fittings.

Class 22. *Casting.* All appliances, machines, modes, and tools used in foundries, excepting type-foundries.

Class 31. *Dairy.* Includes all machines and appliances for milking, butter and cheese making, except milk coolers and testers.

Class 37. *Excavating.* Everything relating to excavating, boring, and grading, well curbs, Artesian wells, post hole borers, sand pumps, submarine excavators, etc.

Class 39. *Fences.* Includes also gates, posts, post drivers, wire stretchers for fences, etc.

Class 40. Files, rasps, and machines for making, redressing, and sharpening.

Class 45. *Furniture.* Basin clamps, blacking boxes and holders, broom hangers, cigar racks from this class are destroyed; but the whole of the class, except these few articles, is saved.

Class 47. *Garden and Orchard.* Includes tools (not machines) for digging, cultivating, and preparing the soil, planting, transplanting, weeding, protecting, potting, and forcing plants and trees; orchard culture, destroying insects, gathering fruit, sorghum strippers, and maple sap gathering.

Class 49. *Glass.* All relating to the composition, tools, machines, presses, furnaces, pots, and other apparatus for manufacturing, cutting, and roughing glass, modes of manufacturing glass articles, and some processes for ornamenting glass.

Class 51. *Grinding and Polishing.* Everything relating to the modes, apparatus, tools, processes, and appliances for grinding and polishing glass, metal, stone, and wood.

Class 53. Includes everything relative to the manufacture of hardware; but not the articles when manufactured.

Class 55. *Harrows.* All devices for scratching, rolling, and pulverizing the soil; also corn and cotton-stalk choppers and pullers, and stone gatherers.

Class 56. *Harvesters.* This includes all kinds of machines and implements for gathering and securing the crops (excepting hand hay rakes and forks), all the models of which, with the exception of the cutters for harvesters and about thirty of the old models of reapers and mowers, were destroyed.

Class 57. *Hoisting.* Includes every appliance used in elevating all kinds of solid materials, loading machinery, stump extractors, capstans, and windlasses.

Class 59. Consists of horseshoes and machines for making them. The former were saved and the latter destroyed.

Class 60. *Hose.* Most of this class was saved, but hose couplings, bridges, and spanners were destroyed.

Class 61. *Hydraulic Engineering.* All relating to aqueducts, canals, dykes, harbors, breakwaters, docks, quays, sub-aqueous explorations and works, piles, improvement of rivers, etc.

Class 64. *Journals and Bearings.* Includes all journals, bearings, shafting, couplings, lubricants, lubricators, belt shifters, tighteners, pulleys, and universal joints.

Class 65. *Kitchen Utensils.* Apple corers, slicers, and parers from this class were burnt, but all the remainder was saved.

Class 72. *Masonry.* Includes all structures of stone, brick, concrete, and iron, plastering and plasterer's tools.

Class 74. *Mechanical Powers.* All relating to horse powers, arrangement of gearing, brakes for machinery, cranks, pitmans, treadles, modes of converting, multiplying, reversing, and transmitting motion, pawls and ratchets, rope clutches, eccentrics, cams, traction wheels, spring motors, fly wheels, and tide powers.

Classes 75 to 82. Relate to metal working, all the models of which were destroyed, with the exception of tacks, staples, nails, spikes, machines for threading sheet metal caps, eyelet machines, tuyeres, alloys, nut locks, wood screws; screw taps, plates and dies; manufacturing sewing machine shuttles and cop tubes, machines for making, upsetting, and bending tire, manufacturing carriage axles, lining axle boxes, tire setting and cooling, farrier's tools, anvils, machines for twisting metal, and the manufacture of spinning rings.

Class 83. *Mills.* All the cases relating to machinery for grinding bark, cane, coffee, grain, gunpowder, paint, spice, and sugar; flour bolts, rice cleaning, hulling, and polishing; smut, scouring and hulling machinery in general.

Class 85. *Nails.* This class includes the different varieties of nails, spikes, tacks, and staples, which were saved, and the machinery for making, all of which was destroyed.

Class 86. Includes machinery for the manufacture and preparation for market of pins and needles, all of which was destroyed except one of Crosby's.

Class 90. *Ores.* Apparatus, machines, and processes for crushing and grinding ore, stone, coal, or bone; for separating ores of precious metals, mechanically or by amalgamation.

Class 94. *Paving.* Includes all patents relating to the materials, compositions, making, repairing and sweeping sidewalks and roadways; paver's tools and machines; garbage boxes; vault covers and lights.

Class 97. *Plows.* All machines employed for plowing, breaking, digging, trenching and paring the soil, cultivating crops, digging roots, and laying tile.

Class 98. *Pneumatics.* This includes all mechanical applications of air and other elastic fluids (excepting motive power engines), balloons, and ventilation.

Class 100. *Presses.* Includes presses of every description, except hydraulic, printing and copying, the last two of which, with their appropriate class No. 101, were saved, but the hydraulic and the other presses were destroyed.

Class 103. *Pumps.* This class includes all machinery for pumping or elevating liquids, hydraulic engines, jacks, presses and rams.

Classes 104 to 106. *Railways.* This includes everything relating to the roadway, cars, and their fittings.

Class 107. *Manufacture of Railway Irons.* Includes every machine or process for manufacturing or repairing rails, car irons, axles, tires, wheels, and metal fittings.

Class 108. *Roofing.* All cases relating to the materials, compositions, and varieties of roofing, apparatus for roofing, skylight operators, eave troughs and brackets, roof fenders and spouts.

Class 110. *Saws.* Includes everything relating to saws and sawing machinery.

Class 111. *Seeders and Planters.* All machines and devices for sowing and planting seeds and distributing fertilizers. These were all destroyed except the cotton seed planters, of which only a few were lost.

Class 113. *Sheet metal.* Includes all modes, machines, and tools for the manufacture of articles from sheet metal.

Class 119. *Stabling.* All relating to the care of horses, cattle, sheep, and poultry; shelters, stalls, preparation of food, feeding, and currying.

Classes 121–2–3. *Steam.* From this class (which includes all kinds of steam machinery, locomotives, etc.,) traction engines, lubricators, and steam and air brakes have been burnt. The remainder being saved.

Class 125. *Stone Lime and Cement.* Includes mining, quarrying, boring rock, stone, marble and slate working, artificial stone; lime, mortar, concrete and cement.

Class 130. *Thrashing.* All machines and devices for husking, thrashing, shelling, winnowing and stacking.

Class 131. *Tobacco.* Includes all processes, machinery and appliances for the manufacture and use of tobacco.

Class 134. *Tubing and Wire.* All methods and machines for the manufacture of tubing and wire.

Class 137. *Water Distribution.* Includes well tubing, filters, pipes, couplings, fountains, hydrants, irrigating devices, street sprinklers, and railway water tanks.

Class 138. *Water wheels.* All the models of the different kinds of water wheels, chutes, forebays, penstocks, and gates for water wheels.

Class 140. *Wire working.* Includes the manufacture of wire articles of every description, all of which were destroyed except wire cloth and looms for making it, and machines for making wire heddles.

Class 141. *Wood Screws.* This class includes the different varieties of patented screws, most of which were saved, and the machines for their manufacture, all of which were lost.

Classes 142–3–4–5. *Wood working.* All the models of these important classes, which include all machines and tools for working wood (except saws and sawing machinery, which are also destroyed—see class 110), were burnt.

If a model cannot be placed under any of the above classes, it may, as a rule with very few exceptions, be considered as saved.

NOTES OF PATENT OFFICE DECISIONS.

The appeal from the decision of the Board of Examiners-in-Chief, in the matter of the application of Phillips, for improvement in paper, has been decided adversely to Phillips. The purpose of his invention was to make a paper suitable for the manufacture of paper bags and other like articles, which should be cheap and strong, and at the same time possessed of a good finish. To this end he provided two vats in his paper machine, one of which contained bleached pulp, and the other unbleached pulp, from the same stock and of the same quality. A layer of bleached pulp was superposed upon one of the unbleached, and the two felted and compressed together during the progress of the continuous web through the machine. The effect was to make a paper having a bright exterior surface from the presence of the bleach pulp, and at the same time possessed of the requisites of cheapness and strength from the use of the unbleached.

It was admitted by the applicant that the prior English patent, No. 834, of 1864, resembled his invention not only in the manner of making and the machinery devised for the purpose, but also in the resulting product. The English patentee claimed a compound paper for the purpose of making paper hangings, consisting of a lower layer of the inferior coarser pulp, and an upper layer of finer pulp deposited thereon, and united together as pulp into a single continuous web during their passage through the machine. Phillips, however, rested the merits of his case entirely on the ground that his particular article, a compound paper made of bleached and unbleached pulp, presumably of the same stock and quality, was new to the trade in view of the state of the art, and was therefore patentable. The Commissioner affirms the decision of the Board of Examiners-in-Chief, rejecting Phillips' application for a patent, and holds that, while there was nothing in the English patentee's specification which would lead to the conclusion that his finer and coarser pulps were made from the same stock, yet it was evident that he selected these finer and coarser qualities of pulp for the same purpose proposed by Phillips. He insured a good finish on the exterior by the finer pulp, and strength and durability by the coarser pulp beneath. The bleached pulp which Phillips proposed to employ was well known in its characteristics, and had been in use in the art for a long period of time past. Applied to the unbleached pulp it gave a superior finish, and at the same time made a stronger paper than would be the case if it were used alone. These qualities, however, were set forth in the English patent. Phillips, therefore, had done nothing more than substitute one well known pulp for another, where both performed the same office in the same way and produced the same effect. It might evidence judicious selection to take the bleached pulp in preference to another light one from a different stock, but this involved no invention.

The decision of the Board of Examiners-in-Chief in refusing the claim of James Greaves for a patent on the substitution of polygonal shafts and corresponding sleeve-shaped revolving bearings for round shafts and splines, on the cylinders of a carding machine, is reversed by the Commissioner on appeal and the claim allowed. The condensing cylinders were represented as several feet in length, and were arranged in parallel rows, between which passed the material that was to be condensed. For the accurate and successful operation of the machine, it was necessary that the opposite cylinders should be exactly parallel; but it was found that, upon the end to which the pinion was applied for rotating the cylinder, the round shaft, with its spline, pressed upon by the pinion in its rotation, was rapidly worn, and to such an extent that, after a use of comparatively few months, that end of the shaft would drop and leave the upper and lower cylinders out of parallel with each other. On the other hand, the polygonal shaft being kept from rotation within the pinion by means of its corners instead of the spline, the wear was distributed more uniformly; and further than this, when in operation, the forcible rotation of the pinion acting upon the corners tended to hold the shaft, even when worn, in an exactly central position, so that the wear, although as great perhaps as in the round shaft and spline, became a matter of comparatively little importance, so long as the shaft was of sufficient size to be turned by the pinion. Therefore the Commissioner holds that, while a polygonal shaft is generally a well known equivalent for a round shaft and spline, yet, in this particular connection with the condensing cylinders, the former performed a new and highly important function, not contemplated or called for by any of the previous uses, and was therefore patentable.

Litharge.

Litharge is an oxide of lead, prepared by scraping off the dross that forms on the surface of melted lead exposed to a current of air and heated to a full red, to melt out any undecomposed metal. The fused oxide in cooling forms a yellow or reddish semi-crystalline mass, which readily separates into scales; these, when ground, constitute the powdered litharge of commerce. Litharge is also prepared by exposing red lead to a heat sufficiently high to fuse it. English litharge is obtained as a secondary product by liquefaction from argentiferous lead ore. In grinding litharge, about one pound of olive oil is usually added to each hundredweight, to prevent dust. Litharge is employed in pharmacy to make plasters and several other preparations of lead. It is used by painters as a dryer for oils.

Black Finish for Brass.

Make a strong solution of nitrate of silver in one dish and nitrate of copper. Mix the two together and plunge the brass into it. Now heat the brass evenly until the required degree of dead blackness is obtained. This is the method used by French instrument makers to produce the beautiful dead black color so much admired in optical instruments.

PHOTOGRAPHS OF THE BRITISH NORTH POLE EXPEDITION.—A series of the views has been published under the supervision of Sir George Nares. One photograph demonstrates the discovery of coal in the arctic regions, a solid mass of this valuable material, more than twenty-five feet broad, being depicted. Other pictures show very plainly the nature of the ice masses of which the frozen sea consists, and prove more than all the descriptions in the world how difficult it must be for sledges to make way over this sea of troubles.

TO MAKE SOFT SOLDER DROPS.—Melt the solder and pour it in a steady stream of about one eighth of an inch in diameter, from a height of two or three inches, into cold water. Take care that the solder, at the time of pouring, is no hotter than is just necessary for fluidity.

DIORREXINE.—This explosive, largely manufactured and used in Germany, has been analyzed by M. Fels, and found to consist of picric acid, wood charcoal, beech sawdust, nitrates of potash and soda, sulphur, and water.

A GOOD dryer for paints is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.

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[*Continued from first page.*]

so that there must necessarily be as many blocks or types prepared as there are tints in the pattern. The blocks are constructed of two layers of wood, a thin piece of maple fastened to a thicker backing of pine board. Each block is about 26 inches wide, two feet long, and an inch and a half to two inches in thickness. On the maple all of the design to be printed in a single color is drawn and afterwards cut out by engravers, so that the lines are in high relief. The more delicate figuring is not made in the wood, but is supplied by the insertion of bent pieces of brass, as we shall explain more fully in referring to the manufacture of the printing rollers further on. When the wood carving is completed, the work is brushed over with boiled oil, and when dry sent to the printer for use. The workman stands before a table, Fig. 2, over which passes the paper.

Hanging above the table, supported by an india rubber cord, is the block. The upper end of the cord is attached to a small wheel traveling on an iron guide, so that the block may be swung from the table over to the place where it receives its covering of color. This last is obtained from what is termed the "slush box," which consists of a shallow box, the bottom of which is covered with painted ticking. This box floats on a mixture of water and paper pulp contained in a larger box, so that its bottom is always perfectly level. The workman first places the paper across his table, then swings the block over to the slush box and brings its carved side down on the paint. Next, he carries the block back again and places it on the paper, of course using great care in the registering, so that the impression may fall exactly on the right place. A vertical movable arm attached to a frame above is now rested upon the back of the block, and forced down by a lever worked by the foot of the operator. This process is repeated until the whole piece is covered with the pattern, when it is hung up until perfectly dry.

Hand printing is now used on borders where there are many colors, and in the finer qualities of decorated paper, where the care requisite for printing the numerous tints can scarcely be exercised during the motion of the rapid working cylinder machines. In

ROLLER PRINTING

the impression is obtained from a series of rollers, on the surface of which the design is raised. This process is used for all the cheaper grades, and hence for very much the greater proportion of all the wall paper manufactured. The rollers are of maple lined interiorly with brass. Four different sizes are used, measuring respectively 13, 16, 18½, and 22 inches in circumference. Their width in all cases is 18½ inches. The pattern of the design is first drawn on paper and colored, and then the outlines of the various parts are transferred upon the rollers, each roller printing, as before stated,

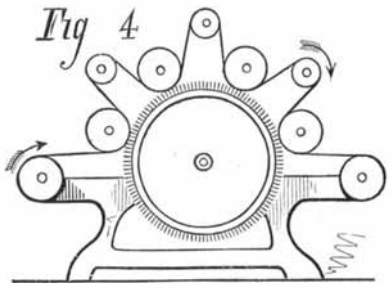
GROUNDING MACHINE.

only such portions as are of one particular hue. Unlike that of the blocks described above, the surface of the roller is not engraved away, but the pattern is made by driving in pieces of thin brass, which the workman, Fig. 3, bends in a vise so as to correspond with the lines of the pattern. Where there is a considerable area to be printed "solid," its outlines are raised in brass, and inside the metal boundaries thus made is packed glued felt. In some cases where the paper is not grounded rollers are covered entirely with felt with the exception of such portions representing the pattern as are intended to be left white. After the design is thus produced the roller is placed in a lathe, fixed in the slide rest of which is a vertical file which smooths the surface, or if the roller be entirely felted it is submitted, when the glue in the felt is dry, to the action of an emery wheel.

The printing machine consists of a large cylinder or drum around which the paper passes. While being thus carried the paper receives an impression from each roller in turn, the rollers being disposed around the periphery of the cylinder. Each roller is supplied with color by an endless belt of felt, which passes down into a receptacle filled with the paint. If the paper is striped the colors are blended by dry paint brushes held in contact with the surface as the cylinder rotates. In the large illustration on the first page a 12 roller machine is represented. This prints therefore twelve colors at once.

HAND PRINTING.

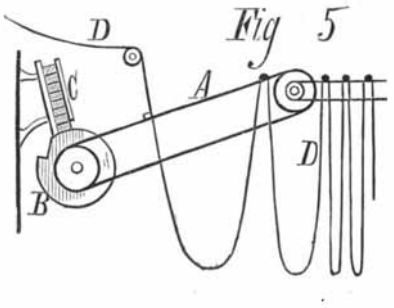
If, however, the paper is to be satin finished, before the above operation takes place it is put through a polishing machine shown in section in Fig. 4. This consists of a central rotating brush against which the paper is carried by several metal cylinders. The alumina and oil in the groundwork admit of its being finely polished. The printed pattern is, however, in dead color, so that when the paper is finished some portions have a luster while others do not, thus adding to the detail of the ornamentation.



POLISHING MACHINE.

As the printed sheet emerges from the machine, it is led over sticks on endless belts the same as before described during the grounding process. An ingenious device is employed for placing the sticks under the paper, which is represented in Fig. 5. At the ends of the roller over which the endless belt, A, passes, are two cams, one of which is shown at B. Above the cams and resting on their periphery is a pile of sticks, C. The cam shoulder equals in height the thickness of one stick. Hence at each revolution of the cam a stick is moved from the bottom of the pile and carried down on and across the belts. Between the latter comes the paper, D, which thus falls in folds over the sticks as they are laid in place.

After the paper has been carried on the belts to the end of



the loft (becoming dried meanwhile) its end is connected to a swiftly rotating horizontal spindle which winds it into tight rolls. These measure but 8 yards in length, the sheet being cut by the attendant as soon as a mark placed by the printing machine comes to the spindle. If the paper is to be embossed this is now done by passing it between engraved metal rollers. Nothing further then remains but to send it to the markets.

THE COLORING MATERIAL

is made of ordinary dry pigments combined with the Jersey clay and gum substitute. This last is produced from potatoes, large quantities of which are raised for this especial purpose. The tubers are simply dried and ground, the powder forming when mixed with water an extremely adhesive size. Sometimes ordinary glue size is employed. Paris green and the arsenical colors are now rapidly going out of use in paper coloring, chrome green being utilized in preference to the former.

We have obtained the material for this article and the annexed engravings from Messrs. Christy, Shepherd & Garrett the proprietors of one of the largest wall paper factories in the country. The establishment is located at No. 510 West 23d street in this city; 125 workmen and 13 large printing machines are here employed, producing six million rolls of paper per year.

How to Detect a Ripe Watermelon.

Few people know, from an outside inspection, how to determine the ripeness and the perfection of a watermelon. Inquiries are frequently made in the horticultural journals as to the means to be used to arrive at a reliable rule for settling this question. Within a few days, says a correspondent of the *Country Gentleman*, I have seen directions given to reach a correct conclusion on the subject, by pressing the melon and noting the manner in which it emits a crackling sound under the operation. These results are to be obtained after some experience in judging of its peculiarity under pressure. Considering the vast quantities of this delicious fruit consumed at the north, after shipment from the sections where the vine flourishes, but where the fruit is always picked in an immature state in order to bear transportation well, it is really a serious matter to be able to know certainly when buying a melon, perchance on the street or at a dealer's stand, whether one is securing a ripe melon or not. In nine cases out of ten the chance is that your melon is only half ripe, and therefore not a great acquisition for your dessert.

Now let me give you and your readers an infallible sign by which to know a fully ripened melon. When the melon begins to change color inside, and its seeds to turn black, a small black speck, scale, or blister begins to appear on the outer cuticle or rind. These are multiplied and enlarged as the fruit matures. A ripe melon will show them thickly sown over the surface. A partial development only indicates half ripened fruit. A full crop of blisters reveals its perfect ripeness. When hundreds of melons are strewn

MAKING PRINTING ROLLERS.

along the sidewalk, you will have to look pretty sharply to find one that exhibits a satisfactory "escutcheon," to borrow a term from M. Guenon. But it is unfailing when found, and by following this guide you may walk away with your melon with the most entire confidence. The blister is only to be seen upon a close inspection, but is plainly visible when that is given.

How to Attach Photographs to Glass.

W. T. Watson, of Harriston, Cadada, gives the following method to fasten photographs on glass without leaving air bubbles, and also how to make them transparent: Allow the photograph to remain in water until thoroughly soaked, then place between blotting paper. It should remain until it is just damp enough to be pliable. Then coat the face of the picture with good paste made from flour or starch, and lay face on the glass. Commence in the center of the pic-

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ture and rub outwards toward the edges to dispel all air and paste. Be very careful not to get paste on the back of the print. Keep it damp with a sponge until the rubbing is finished, being careful not to break the surface of the paper. When perfectly dry, lay on a heavy coat of castor oil and it will soon become transparent. If too much oil, rub off the surplus with a cloth. Allow it to stand a day or two, when it may be colored.

IMPROVED APPARATUS FOR TESTING BANK CHECKS.

The device herewith illustrated is intended as a safeguard for bank checks, which will enable any alteration or raising of the figures of the same to be at once discovered. Certain perforations are made in the paper which, by their position, indicate the true amount, but it is impossible for any one to make these perforations at the right places, unless he possesses the depositor's peculiar combination, while the presence of a perforation in the wrong place immediately discredits the check.

The invention includes two separate devices—one to be in the possession of each depositor, the other to be kept by the bank. The first is represented in Fig. 2, the second in Fig. 1. Both have metal base plates, A, to which are hinged other plates, B. The plate, B, in Fig. 2, has inscribed upon it just seven concentric polygons, which are intersected by thirty-one radial lines. At each of the points of intersection (except at those on the innermost polygon, where they are spaced further apart) apertures are made. The radial lines are numbered as shown at their outer ends. These numbers are called combination numbers. The apparatus used by the bank is represented in Fig. 1. In the outer plate, B, is a circular hole around which numbers are marked. Within the circle is placed a loose polygonal plate, C, marked off and perforated in precisely the same way as the outer plate of the depositor's apparatus. This plate is held in position by lugs, D, and is provided with a handle or extension piece. E.

The mode of using the device is as follows: On the depositor's portion, Fig. 2, is inscribed the number 68. This gives 18 as the index number of that particular apparatus, 50 being taken as the starting point. We will suppose that the index being 18, the depositor's combination number is 22, and the amount of his check $1,225. After filling out the check, he places it on his plate, A, beneath the plate, B, Fig. 2. A pin at F, in the lower plate, then perforates the check, and enters a hole in the upper plate. Beginning with the units of the sum to be marked 5, is added to the combination number. The total of 27 is now found on the edge of the polygon, and through the hole in the outside polygonal line opposite that number a hole is pierced by the pin shown at G. The figure in the ten's place or 2 is next added to the combination number, and the pin is forced through the hole in the second polygonal line opposite the number 24, and so on, the hundreds being marked through the third polygonal line, the thousands through the fourth, and so on to the tens of thousands. The hundreds of thousands and the millions are marked in the two inner polygonal lines

When a check is received at the bank the index and combination numbers of the depositor are noted. The plate, C, is then adjusted to bring the zero point opposite the depositor's index number on the surrounding circle, the handle, E, furnishing a convenient means of doing this. The check is then placed so that the pin, G, on the plate B, Fig. 1, corresponding in position to the similar pin in Fig. 2, enters the hole in the check made by the latter. The perforating pin, F, is then used in the same manner as already described. The check in being removed from the apparatus is examined, and if no new punctures have been made it is genuine; but if new holes have been formed, then there is proof of the raising or forging of the check.

Patented through the Scientific American Patent Agency August 21, 1877. For further particulars address F. and A. D. Grafelmann, Middle Village, Queens county, L. I.

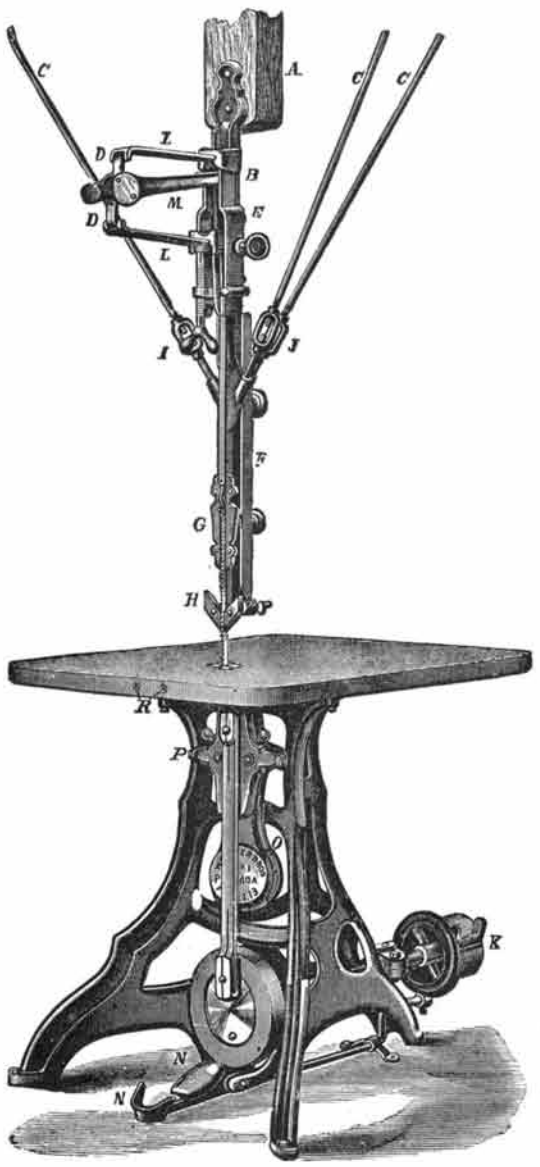
American Machinery in New South Wales.

Messrs. J. A. Fay & Co., the well known manufacturers of woodworking machinery, of Cincinnati, Ohio, inform us that the Metropolitan Exhibition of New South Wales, to which they contributed quite largely, proved remarkably profitable and satisfactory to them. They received four medals in competition with other American and the English manufacturers. We have taken occasion before this to direct the attention of our readers to the extensive demand for improved American machinery in Australia, and Messrs. Fay & Co.'s statement goes further to show the ready appreciation which our industrial products there encounter.

CEMENT UPON IRON OR STONE.—A cement made of glycerin and litharge hardens rapidly, and makes a durable cement upon iron or stone. It is insoluble and is not attacked by acids.

WALKER BROTHERS' IMPROVED SCROLL SAW.

Workers in wood are generally aware that while the band saw is excellently suited for outside work, it is not so for inside cutting or perforated work. The jig saw, on the other



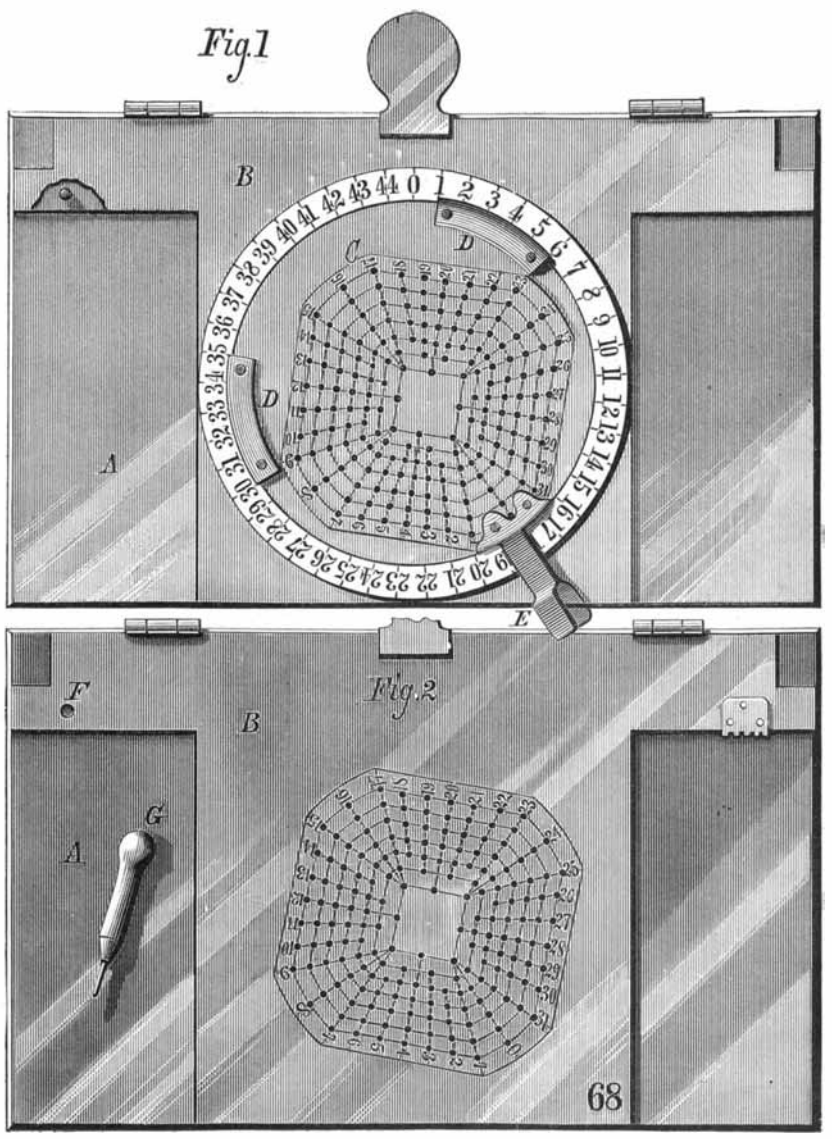
hand, is adapted to both, and for the latter variety especially, owing to the facility with which its blade can be detached or unhooked and passed through the holes made in the piece to be sawed. On its capabilities in this particular are based the claims of superior economy usually advanced for the jig or scroll saw

A new machine of this description is represented in the accompanying illustration. It is designed for general use on medium or fine work in hard or soft wood. It is durably constructed, and is provided with convenient means for the adjustment of all its parts.

As the straining device for the blade is one of the most important features in the construction of the scroll saw, special attention may be directed to the ingenious arrangement herein embodied. The object is to produce an even tension on the blade at all points of the stroke, and to enable the strain to be varied at pleasure. Springs, L, links, D, and lever, M, are attached to a casting that may be moved up or down the standard, B, for blades of different lengths. More or less strain may be imparted by turning the hand nut, I, so moving the lower spring, L. As the lever, M, travels on its upward or downward stroke, it throws the supports of the limbs, D D, forward and backward; in this way the lever tension of the blade is maintained. The links, D, are attached to the ends of the springs and lever so as to roll on their points of contact or bearing surfaces, thus reducing friction of the working parts. The upper and lower fastenings for the saw blade are made to fit any thickness, and the blade can be quickly changed for perforated work without raising and lowering the upper slides or hold down, F. The lower slides, P, have a parallel adjustment, and are set up for wear by simply turning one screw, P, at the sides of each slide.

A small rotary blower, O, attached to the frame under the table and driven by a pulley on the balance wheel shaft, forces a blast of air against the sawdust as it comes from the blade, keeping the slides free from dust, preventing absorption of the oil in the lower slide and guides, and preventing the noise and heat so common in slides when running loose and dry. A rubber tube, not shown in the engraving, is attached to the blower and conducts the air above, keeping the sawdust from the working lines of the sawyer.

The table is made of wood or iron, as preferred, and the filling around the saw blade may be of wood or of hardened steel. The latter is kept in place and adjusted by the screws, R, in front of the table. The hold down, F, and the slides, G, may be adjusted independent of each other for thickness of stuff or length of blade, and the back and side guide, H, removed, when not in use, for long or narrow blades. The lower slides, P, may also be set up for wear and kept parallel without trouble and loss of time. The saw is started and stopped by the foot of the operator on the rod and brake, N, and the belt shifter, K—another important improvement—may be set for the belt in any direction. All the parts are well made and fitted, and guaranteed in every respect. The pulleys are 6 inches diameter by 3 inches face, and should make from 900 to 1,050 revolutions per minute. Patented May 27, 1873. For further information address the manufacturers, Messrs. Walker Bros., 73 and 75 Laurel street, Philadelphia, Pa.



APPARATUS FOR TESTING BANK CHECKS.

Egg Raising.

The egg traffic of this country has risen to an importance which few comprehend. The aggregate transactions in New York city alone must amount to fully $8,000,000 per annum, and in the United States to $18,000,000. A single firm in that line of business east handled $1,000,000 worth of eggs during the year. In Cincinnati, too, the traffic must be proportionally large. In truth, the great gallinaceous tribe of our country barnyard contributes in no small degree to human subsistence, eggs being rich in nutritive properties, equal to one half their entire weight. Goose, duck, hen, pullet, and partridge eggs are the principal kinds produced in America. We have nothing, however, like what we are told used to be found in Madagascar, or have been found there, the gigantic woa egg, measuring thirteen and a half inches in extreme length, and holding eight and a half quarts. One of these birds, with a single effort, might supply a modern boarding house with omelettes for a day.

The perishable nature of eggs has naturally detracted from their value as a standard article of diet. The peculiar excellence of eggs depends upon their freshness. But lately the process of crystalizing has been resorted to, and by this process the natural egg is converted into a vitreous substance of a delicate amber tint, in which form it is reduced seven eighths in bulk compared with barreled eggs, and retains its properties for years unimpaired in any climate. This is indeed an achievement of science and mechanical ingenuity, and has a most important bearing on the question of cheaper food, by preventing waste, equalizing prices throughout the year, and regulating consumption. In this form eggs may be transported without injury, either to the equator or the poles, and at any time can be restored to their original condition simply by adding the water which has been artificially taken away. The chief egg-desiccating companies are in St. Louis and New York. No salts or other extraneous matters are introduced in the process of crystalizing, the product being simply a consolidated mix-

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ture of the yolk and albumen. Immense quantities of eggs are preserved in the spring of the year by liming. Thus treated they are good for every purpose except boiling. It is a common trick for some dealers to palm off eggs so treated as fresh, so that imposition is easily practised. In the desiccating process, however, the difference becomes apparent, as from four to five more limed eggs are required to make a pound of eggs crystalized than when the fresh eggs are used, and eggs in the least taintedwill not crystalize at all.

Some of the most experienced egg dealers declare that there is no profit in raising poultry to compare with producing eggs. A single hen will lay from twelve to fifteen dozen eggs per annum, selling at an average of thirteen cents per dozen, and the birds thus occupied can be housed and fed for less than fifty cents for the whole period. In the East the price per dozen is much higher. Here we buy them by the dozen. Step into an eastern produce or grocery establishment, and they sell so many eggs for a quarter of a dollar. There is no reason why the crystalizing process should not become quite general, and egg production stimulated as never before, and the food supply receive large accessions from this source. The already great and increasing consumption of eggs in England and France shows growing appreciation of this form of food compared with any other. It is thought the annual sales in the United States alone must aggregate nearly $20,000,000. In Lima, Peru, eggs sell at one dollar per dozen, equal to four dollars per pound crystalized. It is thought that this new process of preserving for utilization the industry of our hens and pullets may be very acceptable as well as beneficial in a business and domestic point of view.—*Cincinnati Commercial.*

An American Surgeon in England.

Dr. Sayre seems, from all accounts, to be having quite an ovation among our British cousins; and probably no American surgeon ever before received such marked attention on their part. The *Lancet* for July 14 announces his arrival in London, and offers him a cordial greeting, and, in the issue for July 21, gives an extended account of the principal points insisted on by Dr. Sayre "in his forcible expositions of pathology, diagnosis, and treatment of spinal curvature." All the late numbers of the *British Medical Journal* contain references to his visit. That of July 14, in speaking of his demonstration at University College Hospital, gives the details of his method of treatment of Pott's disease and lateral curvature, and those for July 21 and July 28 contain reports of his demonstrations at St. Bartholomew's and Guy's Hospitals respectively.

His first demonstration of his method in London was at University College Hospital, by invitation of the surgical staff, before an immense audience.

Tuesday, July 17, he delivered a clinical lecture at St. Bartholomew's Hospital, at the invitation of Mr. Callender, and the same week he also appeared at the London Hospital. Wednesday, July 25, he visited Guy's Hospital, by invitation of Mr. Durham, and "put up" two cases of Pott's disease and one of lateral curvature, before a large number of the profession. The first of the cases of Pott's disease was the daughter of Dr. Gooding, of Cheltenham, and the second a child of eleven, who had never stood, and the worst case, Dr Sayre said, which he had ever seen. In less than half an hour he had the satisfaction of making her walk, which, of course, created the greatest enthusiasm among the audience. On the day following, he "put up" four cases at the Royal Orthopædic Hospital, of which he had previously had photographs taken.

Dr. Sayre then made a visit to Birmingham, at the request of the branch of the British Medical Association located there, and, by invitation of Mr. West, senior surgeon, gave a demonstration in the amphitheatre of the Queen's Hospital, which was crowded to its utmost capacity. He lectured for one hour, during the course of which the plaster jacket was applied to two cases of Pott's disease, and one of lateral curvature, and at its conclusion, Mr. West made a fine address, and moved a "hearty welcome and thanks to the great American surgeon." The sequel is thus described by an eye witness: "Mr. Furnieux Jordan seconded the motion with such a glowing tribute, and in such fervid eloquence, that Dr. Sayre became completely overcome. He spoke of the millions of human sufferers, heretofore tortured by rack and screw, and even then left miserable and misshapen, which would now be made easy and comfortable, and restored to perfect health and perfect form. He thanked God that the days of the hunchback had passed away, and that the instruments of torture would never again be resorted to. At the conclusion of his remarks there was not a dry eye in the house, and there probably never was such a scene in any medical meeting before. Tears of gratitude got the better of Dr. Sayre's ability to speak, and he broke down completely in his first attempt to respond. In a few minutes, however he sufficiently recovered himself to express his appreciation of the sentiments just uttered, and shortly afterward so electrified the audience with his enthusiasm that one would have thought the roof would go off the amphitheatre."

On the 6th of August, Dr. Sayre was to go to Manchester to be present, as a delegate from the United States, at the annual meeting of the British Medical Association; after which he expected to devote himself for a time to the preparation of a work on the treatment of spinal disease, which will be immediately put in press by Messrs. Smith, Elder & Co., of London. During his stay in England he has been the recipient of much generous hospitality. Among the pleasantest of the entertainments which he has attended were a delightful breakfast, attended by all the principal men of the place, which Mr. West gave him at Birmingham, and a magnificent dinner in the Royal Hall of St. Bartholomew's Hospital, at which there were nearly four hundred guests present.

Rennet and its Preparation.

The manufacture of cheese depends upon the peculiar property possessed by casein of being curdled by acids. On the addition of an acid to milk, the casein, or cheesy portion, which constitutes three fourths of the nitrogenous matter present, is separated from the liquid, and this separation of milk into curds and whey is the first step in cheese making. Curd may be formed either by the addition of an acid, or by the juice of certain plants, or, as is the universal practice in this country, by the use of rennet, which is prepared from the fourth stomach of the young calf. Its peculiar action in coagulating the casein of milk is due to the presence in this stomach of minute cells contained in the gastric juice, and the process is one of fermentation, rapidly effected by minute microscopic bodies, of which the liquid composing the steepings of rennets is full. Over one thousand of them have been counted in one five hundredth part of a drop taken from a gallon of water in which a single rennet had been soaked; hence at this rate a good rennet would contain two hundred thousand millions of them. It is claimed that this active agency in rennet may be multiplied and carried from one lot to another of milk, the same as leaven in bread making, and hence rennet is really a true yeast.

It is only the fourth, or true digesting stomach of the calf, from which rennet can be prepared out of the inner lining or mucous membrane. They are usually in their best condition when the calf is from five to ten days old, but do not vary materially in strength while the young animal lives entirely on milk. As soon as the calves begin to live on solid food the strengths of their stomachs as rennets grow feeble. The calf should be perfectly healthy, must have suckled the cow four or five days, and to within a short time of killing. If it has been without food for any length of time the stomach becomes inflamed and congested with blood, and especially so if the calf has been driven or carried much of a distance, since then it is of no value for rennet. The stomach should be taken out and well cleaned at once after the calf is killed, by careful wiping with a moist cloth or sponge, or by rinsing, but in no case should water be poured upon it. As soon as cold, let it be lightly salted and left to dry on a dish for a day or two, then stretched on a hook or crooked stick, and hung up to dry in a place where the temperature is moderately warm. The Bavarian method is to blow up the rennet like a bladder, and tie one end to keep out air, first putting on it a little salt at the place were tied; the skins, being thus made very thin, will dry rapidly and keep well; sometimes they are suspended in paper bags.

Rennets lose their strength if kept too warm, but they are much improved by alternate freezing and thawing if kept open to dry air; they should not be allowed to gather dampness, since their strength will evaporate if thus exposed. Their quality improves by at least one year's age and they part with the strong odor so common to green rennets. This prepared stomach or rennet, when steeped in water, produces a decoction which possesses the power of thickening milk or of decomposing it and separating the casein from the liquid or whey. The most convenient way to prepare the rennet for use is to place the stomach in a stone or earthen jar containing a brine sufficiently strong to prevent it from tainting, with not exceeding two quarts of cold water: allow the whole to stand for five days; then strain and put it into bottles; or the rennet may be soaked over night in warm water, and next morning the infusion may be poured into the milk.

In from fifteen to sixty minutes the milk becomes coagulated, the casein separating in a thick mass. The rennet possesses the chemical property of producing lactic acid, by acting upon the sugar in the milk; the acid unites with the soda in the milk, which holds the casein in solution, when the casein separates, forming the curd. Showing the wonderful power of this agency, by taking a single ounce of this membrane or rennet thoroughly washed and dried, and placing it into eighteen hundred ounces of milk, heated to 120° F., complete coagulation of the whole quantity will shortly follow. Remove the rennet from the curd, again wash, dry and weigh it, and it will be found to have lost but one seventeenth part of its weight. Thus it may be proved that one part of the active matter of the stomach may coagulate about thirty thousand parts of milk.

It would be seen from these facts that but a small comparatively small amount of rennet would be required by our cheese factories; but such is not the case. The desire to hurry cheese off to market in ten or twenty days from the hoop requires far more of the rennet than is absolutely necessary in the more moderate operations of private dairies in former days. The home supply from the millions of calves which are slaughtered in this country is wholly inadequate to meet the demand for rennets, hence they are largely imported from Europe. It is to be hoped that the enterprising chemists and investigators of the age will discover some method of extracting the active agent in rennet, and in a state of absolute purity and fredom from objectionable animal matter, with a degree of uniformity in strength as well as concentrated form. While American cheese making has made wonderful progress during the past twenty years, their yet remains a wide field for careful study and intelligent progress.

To Find the Contents of Boilers.

To find the contents of cylinder boilers multiply the area of the head in inches by the length in inches and divide the product by ·1728; the quotient will be the number of cubic feet of water the boiler will contain. Example: Diameter of head, 36 inches; area of head 1017·87 inches; length of boiler, 20 feet or 240 inches. Now multiply 1017·87 by 240 and the product will be 24,428,380; divide this by ·1728 and the result will be 141·37 cubic feet, which will be the contents of the shell.

In flue boilers, multiply area of the head in inches by the length of the shell in inches; multiply the combined area of the flues in inches by their length in inches, subtract this product from the first and divide the remainder by ·1728; the quotient will be the number of cubic feet of water the boiler will contain.

Proper Speed of Circular Saws.

Nine thousand feet per minute, that is nearly two miles per minute, for the rim of a circular saw to travel, may be laid down as a rule. For example: A saw 12 inches in diameter, 3 feet around the rim, 3,000 revolutions; 24 inches in diameter, or 6 feet around the rim, 1,500 revolutions; 3 feet in diameter, or 9 feet around the rim, 1,000 revolutions; 4 feet in diameter, or 12 feet around the rim, 750 revolutions; 5 feet in diameter, or 15 feet around the rim, 600 revolutions. The rim of the saw will run a little faster than this reckoning, on account of the circumference being more than three times as large as the diameter. Shingle and some other saws, either riveted to a cast iron collar or very thick at the center and thin at the rim, may be run with safety at a greater speed.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NEW SERIES—No. XXII.

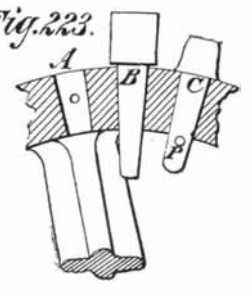
COGGING.

The term cogging is applied by pattern makers and wheelwrights to the process of furnishing wooden teeth to iron wheels, in the rim face of which are cast mortises to receive the wooden cogs. The term cog is applied to the piece of wood out of which the tooth is formed. This includes the shank fitting into the mortise together with the tooth projecting from the face of the wheel. The term tooth denotes the part forming the tooth independently of the part fitting into the mortise.

The object of using cogged wheels is to avoid the jar and noise incidental to the use of large cast gear wheels, which it is found impracticable to cast true. If the wheel is cast from a wooden pattern, this pattern is liable to warp. Furthermore, the rapping of the pattern in the mould tends somewhat to destroy the truth of the mould. Even if these elements of error are eliminated in making the mould by using a moulding machine, the unequal shrinkage of the casting induces untruth. After a gear wheel is cast, the face is then be turned true. While in the lathe a circle may be made for the bottom of the teeth, and another for the

Fig. 224.

Fig. 223.



pitch line. Other circles may be made as are deemed necessary ase guids for adjusting the instruments used to form the outlines of the teeth. The wheel may be marked off as carefully as can be, and the teeth after marking may be chipped and filed to the lines; but it is not found in ordinary practice that by any such means a degree of truth sufficient to avoid jar and noise is attainable. This is especially the case with large wheels, and cogging is resorted to. It is usual to cog the large wheel of a pair that run together, and to make the wood teeth thicker across the pitch line than the iron one. If two cast wheels are made to run together, there is usually given a certain amount of clearance between the spaces and the teeth, whereas, when a cogged wheel is employed, this clearance is dispensed with, and back lash is avoided. The woods generally used for cogging are hornbeam, hickory, button wood or sycamore, maple, and locust. The blocks for the cogs should be cut out and kept so as to thoroughly season before being used. There should, when there is likely to be a demand for them, always be kept a spare set of cogs, so that they will be ready for use, well seasoned and less liable to shrink and thus come loose in the mortises.

When the cast wheel arrives from the foundry it is taken to the machine shop, bored and turned across the face. The mortises receive a little attention, burrs and sprue fins are removed, the rough places levelled, etc. If it should be found that any of the mortises are "blind," that is, stopped by the arms of the wheel, as shown at A, Fig. 223, a cir-

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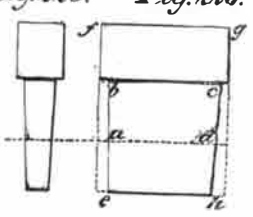
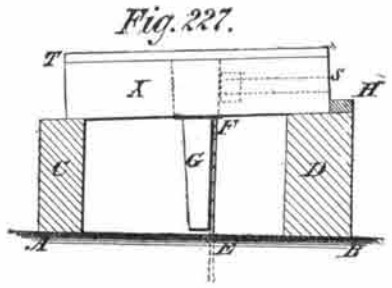
cumstance which is avoided as much as possible in the designing of the wheel, a small hole must be made through the rim to admit of the passage of a wire or screw. The first step taken toward getting out the wood teeth is to obtain the exact size and shape of the mortises. For this purpose, if the wheel is a spur, we must cut out two pieces of thin wood, as templates to fit the mortise, one representing the length of the mortise, as in Fig. 224, and the other its width. The templates must be tried in several holes, so as to insure their being the correct size. *a b c d*, Figs. 225 and 226, represent one of these templates. From it we get the size of the rough cogs. Add above *b c* the height of the finished tooth, and from a quarter to half an inch more, according to the size of the wheel, to allow for turning off. Make a good allowance in this direction, as also at the other end of the piece, for the wood may be bruised by the hammer in driving the cogs in and out. The size of the cog is shown at *c f g h*, the length, *f g*, being that of the finished tooth and not less than $\frac{1}{8}$ inch allowed on each side for turning. To obtain the thickness, take that of the finished tooth, shown at C, Fig. 223, at the thickest part and allow about $\frac{1}{8}$ inch of a side for trimming.

Fig. 226. Fig. 225.



Having now the full size and thickness, cut out the number of cogs required, with three or four spare ones, as some may be split or possess some defect. To avoid damaging the teeth a broad, flat-faced heavy hand hammer should be used to drive them with.

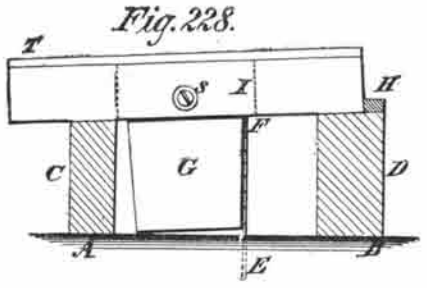
Fig. 227.



It is taken for granted that a circular saw bench is accessible, for without this cogging is made with difficulty. Have the saw in good order, and mount upon it a simple contrivance for shanking the cogs. It is composed of a box and two guides. These are illustrated in Figs. 227, 228, 229, and 230. The parts throughout being marked with the same letters.

Make A C perpendicular with E F. Let E F be the height the saw stands above the table, which should be a little higher than the length of the shank of the cog. To the line, E F, apply the form or template, *a b c d*, of the width of the shank. Produce the top line of this form and it is the top of the guides. Make the guide, C, at such a distance from the saw as to admit of the passage of the cogs the widest way. Make a box composed of two pieces, one piece being of sufficient thickness to take in the whole rough tooth of a cog in a mortise cut through the center of it, as indicated by the dotted lines in Figs. 231 and 232, and shown in full in Fig. 234; the thin piece, T, forms a backing to stop the cog in the mortise, it also, by being placed with

Fig. 228.

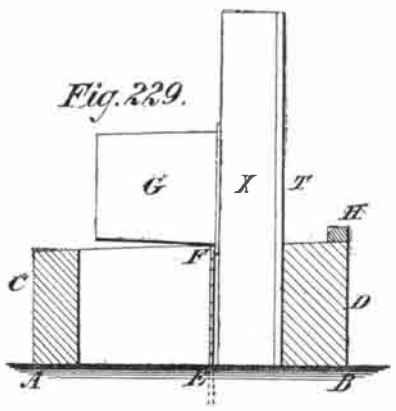


the grain in an opposite direction to that of the box and screwed firmly, adds much to the strength of the box and enables it to resist the strain of the binding screw, S, by which the cogs are held while being sawed. Having the thickness of the box, lay it off upon the opposite side of E F, and draw the guide, D; if, as at G, in Fig. 234, the size of the top of the shank be laid down, then the distance from it to the sides and ends of the box must be equal to E F, the height of the saw above the table. Having the size of the box, we can now mark the position of the guide, H.

Eight movements with the box over the saw shanks the cog, two movements, as in Fig. 231, make slits through the width of the stuff and bring it to the right thickness; at Fig. 232, two movements, with the box held in the direction shown, brings the shank to the width. The box is now to be held with one of its edges on the table and passed between the guide, D, and the saw. It is to be passed through four times. A slab is detached each time. Figs. 229 and 230 illustrate two of these positions, and after turning the box upside down the other two movements may be performed.

Having now completely shanked one cog, it must be compared with the templates and tried in the mortises. Care and patience at this time may save hours of labor in fitting. Proceed now to fit the cogs to the mortises, as at B, Fig. 223, driving them tightly and leaving them with their shoulders, say, $\frac{1}{8}$ inch above the rim at the widest part. Use raw linseed oil to lubricate the surfaces while driving. All the cogs being now driven into their places, take a little instrument, shown in Fig. 224, called a fork scriber, and with this

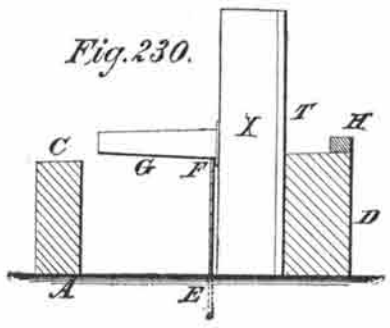
Fig. 229.



trace a line upon the shoulder of each cog by allowing one prong to travel along the turned face of the wheel while the other is pressed against the wood. The shanks of the cogs must also be marked with a common scriber where they project through on the under side of the rim.

Number all the cogs with a pencil, and number two of the mortises with a center punch or stamp, to show the direction of the numbering. Now drive out all the cogs and "shoulder" them, that is, dress the shoulders to the fork scribe line, so that, when driven in, the shoulders will fit the face of the wheel. This being done, mark a mark on the shank; into this mark on both edges of the cog insert the fork scriber and scribe a line parallel to the first but nearer up to the shoulder. This line shows where the under side of the rim will come when the cog is next driven in, for of course it will be driven just as much further as the distance between the two points of the fork scriber. In Fig. 223, observe the pin, P, the top of which lies against the rim, so in finding the center of the hole for the pin we must place it nearly one half the diameter of the wire below the fork scribe line. Make this nearly so as to have a little draw on the cog, and insure that the wire pin shall touch the rim. Then when the cogs shrink and become loose in their mortises, as they often will, the pins will at least keep

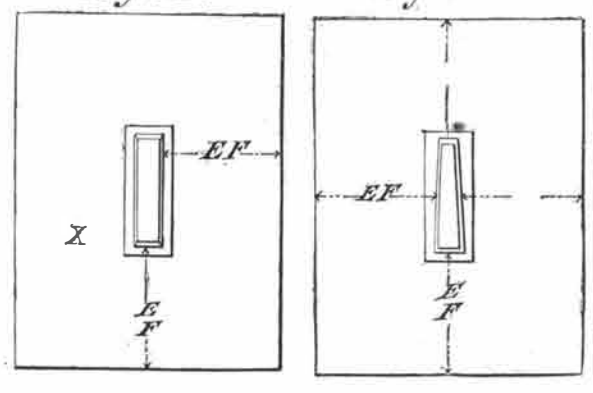
Fig. 230.



the shoulders in contact with the rim. Cogs in blind mortises are made to fit at the first drive and not removed, unless from some oversight it is inevitable. Carefully examine the hole and remove lumps or cut away the wood to escape them, and gauge the size and depth of the hole. Do this to avoid the unpleasantness of having to draw the cog when once driven in.

The cogs may now be bored for the pin. This is most rapidly performed by running a boring bit in the lathe. The ordinary pin bit will do, but let it be so pointed as not to run away from the center mark made with a center punch. It should be lubricated with tallow or beeswax very frequently, or the temper will be drawn, because the material is so hard, and the speed so high. It takes too much time to run the lathe mandrel back and forth by means of its screw, therefore, to remove the cap and wheel, fit a wooden knob or handle on the end of the screw and work the mandrel by hand. This will be clearly understood by turning the

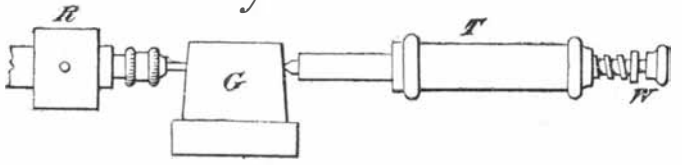
Fig. 231. Fig. 232.



attention to Fig. 233. R is the running head with bit held by a chuck, G, the cog, T, tailstock, W, the knob of wood. This method bores the cogs rapidly and straight. The cog when bored half way may be reversed and the rest of the boring completed from the other side.

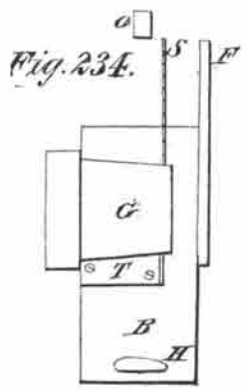
The next process is to saw the shanks off to an equal length measured from the shoulders, which have been dressed. In Fig. 234, S is the circular saw, F a guide strip, B a planed board, H a handle, T a stop. The cog, G, is shown with its shoulders resting against the edge of the board and its side against the stop. In this position it is

Fig. 233.



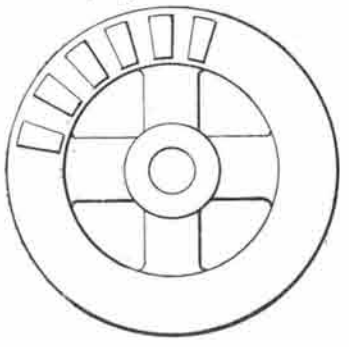
held firmly by the left hand, the right hand seizes the handle and pushes toward the saw. A second stop is show at O; it is fixed to the table to prevent the board by any inadventure from being pushed too far. The ends of the shanks may now be rounded at the corners or chamfered to give them a presentable appearance, and the cogs are ready to be again driven into the wheel. A mixture of white lead and boiled linseed oil is to be made of the consistence of thick paint. This with a piece of stick or brush is applied to that part of the shank which remains in the rim. Each cog is then driven into the mortise, to which it was fitted and which may be known by the number marked on it. Insert the pins, pieces of strong wire pointed like a center punch; these are in length somewhat less than the rim is wide but longer than the tooth. The wheel now goes to the turning shop, where the teeth are turned to the proper size and the pitch lines marked. Upon its return it is divided off, the outlines of the teeth drawn on both sides, and the excess of stuff removed with chisel and gouge. If it is possible to remove a portion with a good sharp hand saw, that may be done, as much time may be saved thereby. When the teeth are all formed, filed, and sand-papered, they may receive a few good soakings of raw linseed oil.

Fig. 234.



In bevel wheels the mortise is narrower at one end than at the other, as shown in Fig. 235. It follows that the shanks of the teeth must be made to fit, therefore an extra template must be made, so as to have one for each end of the mortise. The shape of the mortise, or in other words, the top of the shank and its size, is to be laid down as in Fig. 232,

Fig. 235.



and the distance, E F (the length of the top of the circular saw from the saw to the table), laid off on all sides, so that the box will assume a shape corresponding to that of the shank, the guides remaining the same. In this way the outer edges of the box form a gauge to saw the cogs.

Fast Flying.

A recent contest took place under the auspices of the Philadelphia Pigeon Flying Society, No. 2, the course being from Hamburg to Philadelphia, a distance of seventy-five miles. The birds participating were of last spring's brood, and, without exception, were from first class stock. The weather for the fly was favorable, and the time made the best on record in this country. The winning bird was a handsome blue specimen. The following is the result:

	H.	M.	S.
James Grist	1	13	00
John Dalton	1	41	30
Henry Heintz	1	54	56
William Knight	1	55	35
John Parker	1	57	20
Arthur Chambers	2	01	50
Arthur Chambers	2	04	35
Thomas Grist	2	08	05

AN International Exhibition of hops, and of tools and apparatus used in the cultivation, drying, packing, and preservation of hops, is to be held at Nuremberg from October 7 to 15 next. Forms of application and all necessary information can be obtained from Herr Eduard Vollrath, Nuremberg.

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IMPROVED SLEEPING CAR.

We illustrate herewith a new construction of sleeping cars, by which the same may be easily converted into day or parlor cars. The arrangement is also such as to relieve the upper part of the car from the weight of panels and bedding. Fig. 1 is an interior view of the car with some of the berths in place, and Fig. 2 is a plan view.

The car is provided with fixed side seats of a length equal to that of a sleeping berth. Two revolving chairs are placed in front of and at opposite ends of each sofa. Under the latter is a box which holds a folding bed or mattress, the two stanchions or posts for supporting the berths, the front rail, and the folding panels or partitions which form the divisions between the sections. The location of the chair pedestals, as will be seen from Fig. 2, is such as to secure a free passage way through the car.

In making up the sleeping sections, the stanchions are reared upon the chair pedestals, the chairs being previously removed, folded, and stowed away. The upper ends of the stanchions are secured by a bracket attached to the roof of the car. Near the lower portion of each post is a collar having projections to sustain the lower bed. This collar slides over the junction of post and pedestal. Near the middle of the stanchion is a shoulder to receive and support the front and end rails of the upper berth. The inner ends of these rails have tongues, which enter sockets in the car wall. The berth bottom is supported by cleats on the inner sides of the end rails. This arrangement of separate and distinct end rails gives the advantage of making up the berths either independently of each other or all at once, as desired.

The upper berth is formed by placing the cushions of the side seats on the cleats above mentioned; while the lower berth is made by a folding bed supported upon the long seat frame and the projections on the lower stanchion collar. The ends of the side seats have double walls, to receive between them a panel, which is used to form an extension of the seat end and to aid in partitioning off the berth. Above it, the end partitions are formed by a curtain or flexible partition, which extends outward from the car wall, and which is self-closing by a spring or similar suitable means when not held extended. Rods are provided from which curtains from both upper and lower berths are suspended.

For ventilating the lower berths a vertical flue is formed in the car wall between the windows, and opens into the car just above the berth, with a register. The flue extends to nearly the top of the car, and has an outside aperture. The movement of the car draws air up from the lower berth through this conduit, thus ensuring thorough ventilation. This is an important advantage, and one calculated to render the occupancy of lower berths much more agreeable and healthy.

It will be observed from Fig. 2 that the sections on the two sides of the car are so arranged that the divisions, and consequently the revolving chairs, are not opposite each other, but intermediate.

The principal advantage claimed for the construction above detailed, over that of the ordinary sleeping car where the upper berths are folded up against the roof, is the decreased weight of the vehicle itself. As the upper berths are not fastened to and sustained by the side of the car, that portion need not be so strongly and heavily built as is usually the case. The inventor informs us that, while the common Pullman sleeping car weighs from 28 to 35 tons, his car weighs but 21 tons, a saving in weight of considerable importance.

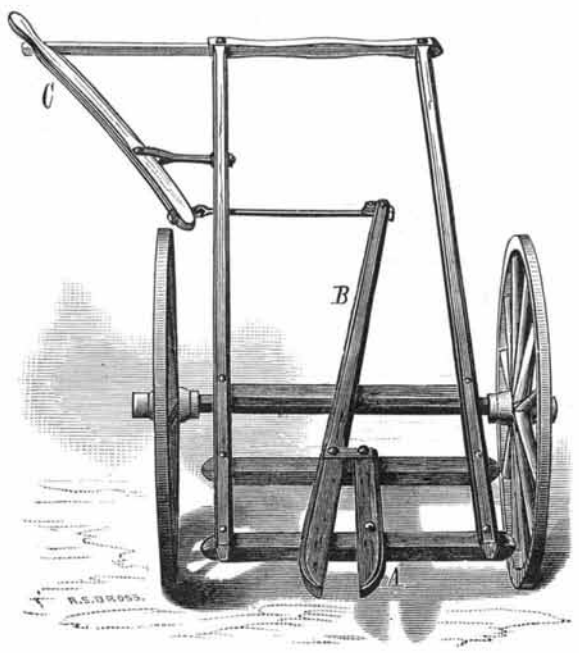
Patented Aug. 14, 1877. For further particulars, address the patentee, Mr E. P. Kellogg, 279 Pearl street, New York city.

To Clean Vessels that have Contained Kerosene.

Wash the vessel with thin milk of lime, which form an emulsion with the petroleum, and removes all traces of it. By washing a second time with milk of lime and a very small quantity of chloride of lime, and allowing the liquid to remain in the vessel about an hour, and then washing it with cold water, the smell may be removed. If the milk of lime be used warm instead of cold, the operation is rendered much shorter.

BROWN'S IMPROVED COTTON STALK PULLER.

We illustrate herewith an improved implement for pulling cotton stalks from the ground, thus freeing the latter from roots likely to interfere with plowing. By its use it is claimed that one man can clear off three acres of stalks in a day.



The device consists of a frame mounted on wheels. To the forward cross bars in front of the axle is secured a stationary jaw, A, and a pivoted jaw, B. To the rear end of the latter is attached a rod connecting with a lever, C, the handle of which comes at the right hand of the operator who pushes the machine ahead of him. The jaws seize the stalk near to the ground. The long rear portion of the frame is then used as a lever—the axle being the fulcrum—to lift the plant clear of the soil. The stalk is finally dropped by turning the machine to one side and opening the jaws.

This apparatus was exhibited at the State Fairs in Austin and Houston, Texas, in 1876 and 1877, and there obtained, we are informed, the highest premiums. It was patented by Mr. R. D. Brown, September 19, 1876. For further information address Messrs. J. J. Conklin & Co. Austin, Texas. .

Projected Trans-Asiatic Railways.

No less than four great projects are now under consideration for railways across the continent of Asia. They are as follows: 1. The Baranowski project or shortest road between Moscow and Peshawur—the English fortress commanding the valley of the Indus. This starts from Saratoff, crosses the Kirghis country, follows the Amon-Deria, and traverses the mountainous region of the Hindoo-Couch. 2. The Lesseps-Cotard project: line extends from Orenburg to Peshawur *via* Omsk, Taschkend, Samark, and Balk. 3. The Bogdanovitch project: line extends from Moscow to Pekin *via* Kazar, Ekatherinoburg, Omsk, Tomsk, and Irkutsk. 4. The Ruththofen project: line joints the Siberian road at Omsk, passing Taschkend, Samarkand, and Balk. At the last mentioned point the route turns to the west to Teheran, and rejoins at Tiflis the Russian Caucasian line now under construction.

The Anthropoid Apes.

Professor Garrod, of London, stated, in a recent lecture, that he had dissected seventy apes out of the anthropoidal class, and one of them exhibited the vermiform appendage of the cæcum, or blind gut, which is characteristic of man. But the anthropoids have it quite humanly developed. The hands and feet of an orang recently dead were exhibited along with those of a man, and presented the same structure. Professor Garrod showed that the structural resemblance between the anthropoid apes and man are so close that the reason for the mental and moral differences remains still an unsolved problem. Perhaps the most striking and important portion of his discussion was that in which he proved that the vocal apparatus of man are present also in the anthropoid apes. The ape does not converse, and yet the difference between his vocal apparatus is so infinitessimal as to defy observation. It is to this point that physiological investigation must now be particularly directed.

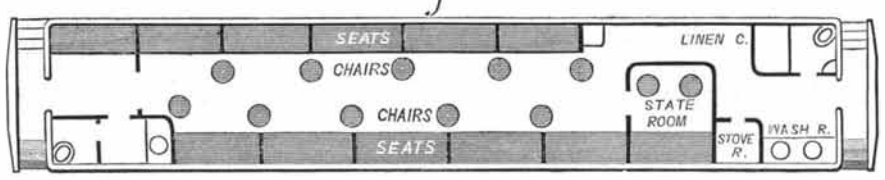
Diet for Walking.

In August last, a pedestrian named Smyth, appearing under the name of "The American Postman," accomplished the task of walking three hundred miles in six days, at Dublin. His regimen during the walk was as follows: He takes a small chop and some cocoa for breakfast. In two hours afterward a raw egg beaten up. His dinner consists of a sago pudding and a small quantity of very raw beef, without drink, and his supper of as much cocoa and bread and butter as he wishes. Each day he is allowed a quart of milk and occasional sips of ginger ale. He takes no alcoholic beverage whatever.

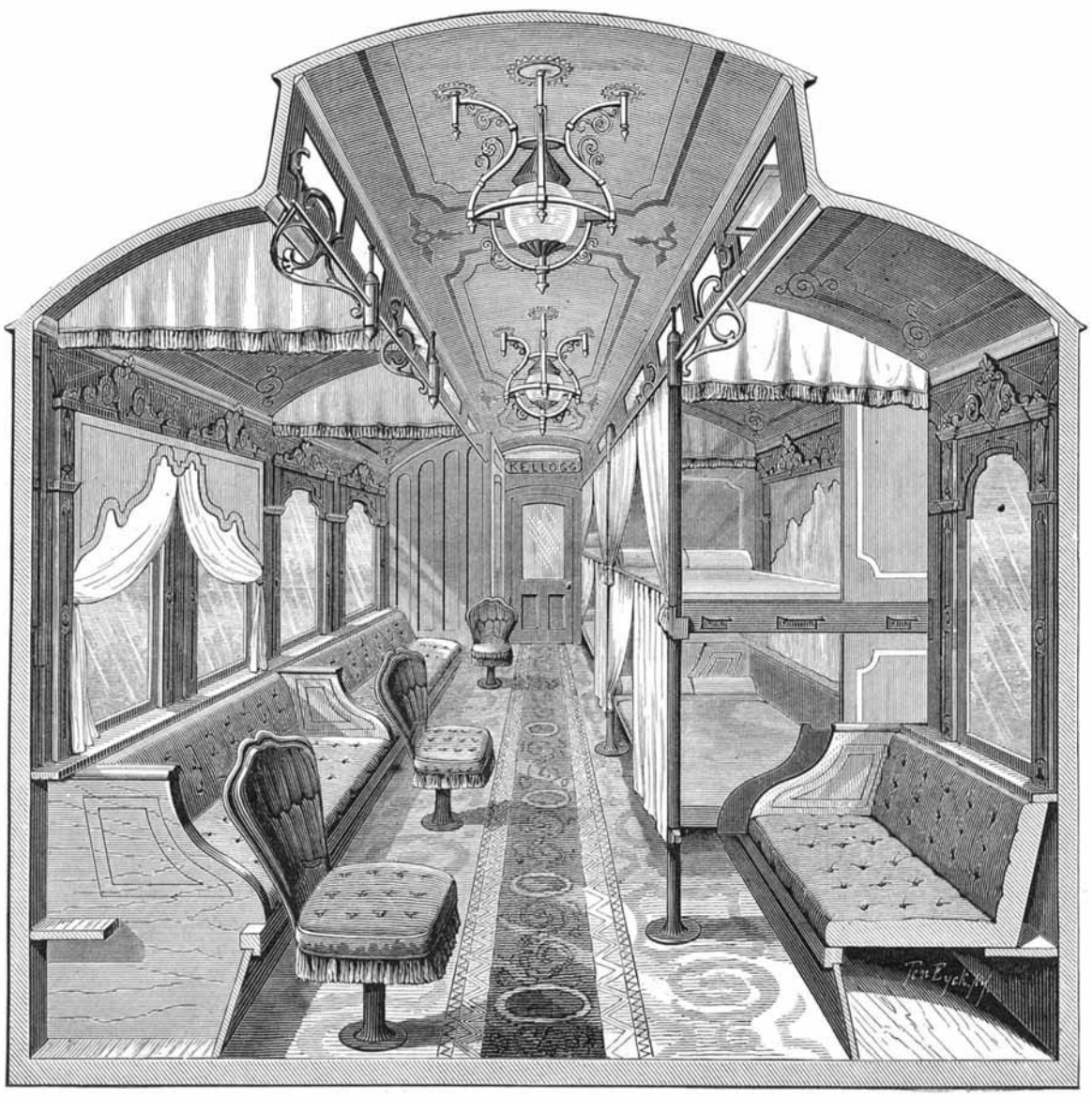
A Fourth Oil Rock.

The existence of a regular fourth sand, south of Bradford, has been conclusively demonstrated by the tests made on the Big Shanty well, located on the Dent track. This well, it will be remembered, was drilled several months ago to a depth of 1,598 feet, striking the third sand at 1,545 feet. The sand was about forty feet thick, and the well has been producing five barrels a day ever since, up to a few weeks ago, when the Company decided to drill the well deeper. This was done, and at a depth of 1645 feet a fourth sand was found, twelve feet in thickness and of a good quality. Pumping has already been started and the supply will be improved.

Fig 2



KELLOGG'S SLEEPING CAR—PLAN VIEW.



KELLOGG'S IMPROVED SLEEPING CAR.—Fig. 1.

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THE SKULL OF THE DOMESTIC FOWL.

BY C. FEW SEISS.

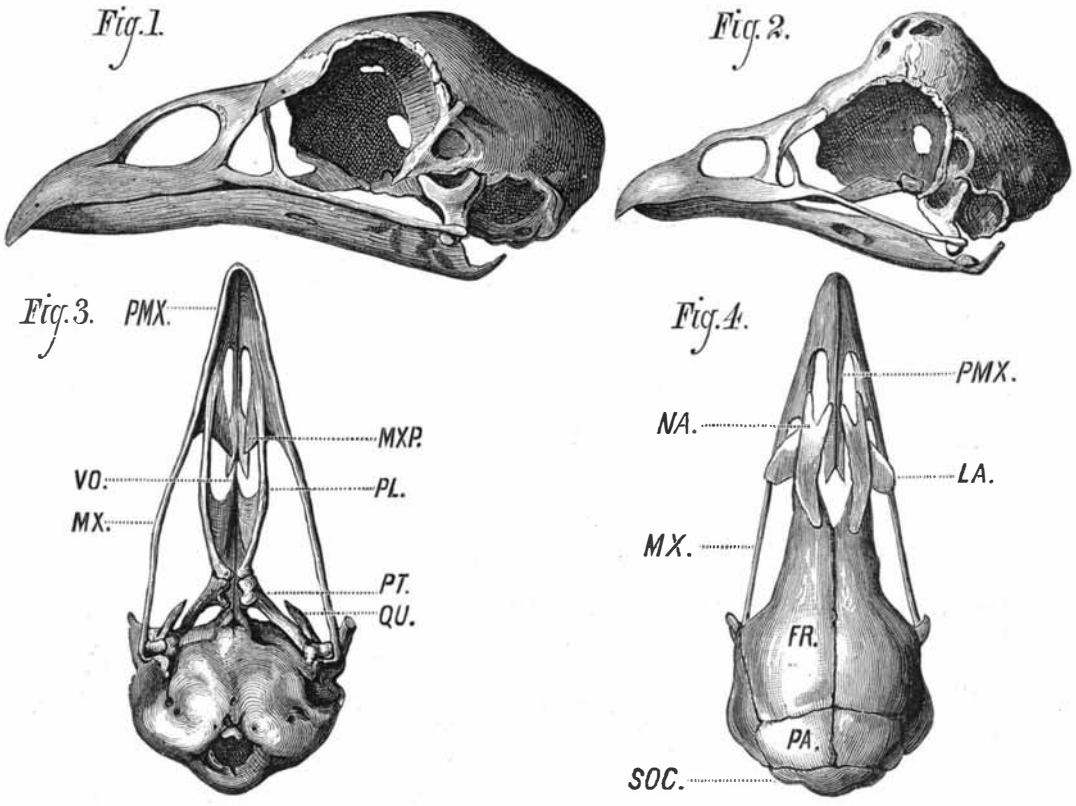
Bones constitute the foundation and framework of all the vertebrated animals; and yet how few persons know, or desire to know, anything about them. I have known ornithologists (?) who could determine the correct species of a bird at one glance, and yet were ignorant of the name and position of almost every bone in a bird's body. This is learning zoölogy before having studied its A B C. An ornithologist who has slaughtered thousands of our birds, simply for their "dry skins," says he "can see nothing in dry bones." I think it would be more beneficial to him and others, and most certainly so to the birds, if he would cease this wholesale slaughter, kill as few birds as possible, and these study thoroughly, both interiorly and exteriorly.

For the first step into the osteology of the aves, I give drawings of the skulls of three varieties of the domestic fowl (*gallus domesticus*). A poultry fancier presented me with the head of a prize "McClellan game cock," and of a "white Polish hen." On examining the skull of the latter I found the frontal region extremely gibbous, and with twelve holes entering into the brain chamber, two of which were two eighths of an inch in length. I do not know whether all individuals of this breed have the skull thus perforated, that is to such a degree as this, but if they have, it were better this white Polish deformity were rapidly and for ever exterminated. The premaxillaries running up between the nasals are weak and thread-like, and indeed the whole skull is weakly put together. We often see among poultry fanciers the most deformed and unnatural breeds the most prized. I would suggest this: Let some popular poultryman work up a fancy breed—something new and interesting—a breed without eyes, and without feet, and give it some good but short name, say, for instance "E-pluribus-unum-sic-semper-tyrannis" fowls. It would be a success. A breed of this description would have many recommendations. It would eat little, never scratch, never suffer from blindness after a combat, and best of all, would be an everlasting "sitter." Poultry fancier, what would'st thou have more?

The skull of the game cock is more of the typical or natural order. The brain case is thick, solid, firm and heavy; the premaxillæ, running toward and between the nasals, are strong, broad, and arched; the *os quadratum* and the maxillæ are strongly made, and the whole skull is substantially put together. It belongs to a breed of chickens which should be encouraged.

I regret the smallness of my collection of fancy chicken crania, for I should like, if able to study out the good or bad points appearing in the various varieties.

Fig. 1 is a lateral view of the skull of the McClellan game cock, and Fig. 2 that of the white Polish hen. Fig. 3 is the under view of the skull of a common chicken, with the nasals, frontals, and lachrymals removed; PMX, the premaxillæ, including the bill and the two narrow bones running up from its center; MXP, the maxillo-palatine process; PL, the palatine bone, with the vomer, VO, between or in the center; PT, the pterygoid; MX, the maxilla (the upper jaw proper); QU, the *os quadratum*, quadrate or anvil bone, with or upon which the mandible or inferior maxillary articulates. Fig. 4 is the upper view of the skull of the cockerel, showing the sutures, the bones not yet anchylosed. The sutures are undistinguishable in adult fowls. FR is the frontal; PA, the parietal; SOC, the supra occipital. The foramen magnum is of the usual size, and, as with all birds, there is but one occipital condyle.



THE SKULL OF THE DOMESTIC FOWL.

Effect of Green Vitriol and Carbolic Acid upon the Growth of Plants.

Both sulphate of iron and carbolic acid are employed to disinfect fecal matter, which is afterwards employed as fertilizer. Nessler has therefore been experimenting upon the effects of these disinfectants upon the germination of seeds and the growth of plants. If the soil was kept quite dry the plants died when 25 parts of sulphate of iron or 10 parts of carbolic acid were added to 170,000 parts of earth. If the soil was moist the plants would stand 200 parts of sulphate of iron and 50 parts of carbolic acid to 170,000 of earth, without injury. When the manure is evenly distributed, as it should be for other reasons too, these disinfectants are uninjurious to husbandry.

LOMARIA DALGAIRNSIÆ.

This plant is a very fine greenhouse fern of arborescent character, with something the aspect of another arborescent form of the same species known to cultivators as *l zamioides*. It has a blackish trunk, which is shaggy at the apex, with long subulate dark brown scales. The fronds are but subcoriaceous in texture, pinnate in the lower part, and pinnatified above; the pinnæ lanceolate, acute, the lower ones small, tapered to the base, but scarcely stalked, the upper ones adnate, and the uppermost decurrently confluent. Below the small basal pinnæ each edge of the stipes is set with a row of abortive ones reduced to wart-like excrescences or callosities. The color of the sterile fronds is a dark green on the upper surface, and a paler green beneath. No fertile fronds have yet been produced.

The plants to which the above description applies have been recently imported from South Africa, and are therefore to be classed as greenhouse ferns. As such they are a valuable acquisition, since they prove to be of free-growing habit, not indicating the tendency of other allied forms to dwindle away; but on the contrary, pushing their fronds with remarkable vigor.

LOMARIA DALGAIRNSIÆ.

Separation of Vanadic Acid from the Alkalies.

The interest which is beginning to be felt in this rare element, vanadium, since it has found such a valuable application in the arts, in dyeing, printing, etc., induces us to insert an abstract of Gerland's paper, on the separation of vanadic acid from the alkalies in the form of ammonium vanadate.

In the first experiment pure pentoxide of vanadium was fused with 3 molecules of sodium and potassium carbonate; the mass was dissolved and precipitated hot with a hot saturated solution of sal ammoniac, and when cold filtered and washed until the filtrate left no residue upon evaporation, then washed with weak alcohol until the chlorine reaction ceased. The salt was pressed and dried over sulphuric acid. An analysis of 1 grain of this salt showed the presence of 2·11 per cent potassium.

In the next experiment ammonium vanadate was prepared from potassium ortho-vanadate, and was found to contain 2·42 per cent of potassium.

The first of these salts, when purified by dissolving in boiling water and pouring into a boiling solution of sal ammoniac, still held on to 0·23 per cent of potassium chloride, while the second contained 0·25 per cent of potassium after re-crystallization and purification.

In a third experiment the pentoxide was converted into sodium orthovanadate by fusing with sodium carbonate; the solution was precipitated by ammonium chloride and purified asbestos. Analysis showed the ammonium salt to be perfectly pure and free from sodium.

These experiments prove that ammonium vanadate cannot be prepared free from potash if the solution contained any potash, while sodium does not adhere to it in this way, hence in analysis the introduction of any potassium salt must be carefully avoided.

Gerland states that several other salts of vanadium also possess this property of carrying down small quantities of potassium which they stubbornly retain. Among these are the neutral and acid vanadid sulphates, vanadylo-sulphate and vanadylid-sulphate.

To a certain extent ammonium acts like potassium, so that metavanadic acid (VHO_3) holds on firmly to a small quantity of ammonium, which cannot be removed by digestion with acid. Copper ortho-vanadate cannot be obtained pure if ammonia were present when it was precipitated.

Prussic Acid to Absorb Carbonic Oxide.

C. Böttinger states that in studying the subject of glyoxylic acid he passed pure carbonic oxide gas through pure hydrocyanic acid

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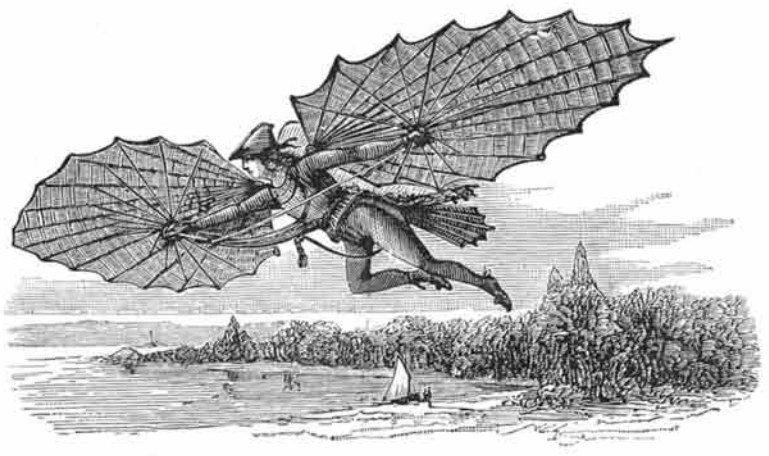
distilled over chloride of calcium and cooled, when he observed a large absorption of the gas. When he treated this liquid with concentrated aqueous hydrochloric acid and shook the two liquids they refused to mix, but formed two layers. On removing the vessel from the cooling mixture the liquid gave out a steady stream of pure carbonic oxide. After some time the evolution of gas became stronger, especially when warmed by the heat of the hand. Prussic acid was then mixed with the carbonic oxide. Finally, the liquids mix with violent gas evolution. The products correspond to those of pure prussic acid. He was unable to obtain glyoxylic acid in this manner. The experiment was repeated a second time with precisely the same results.—*Berichte d. D. Ch. Gesell.*

SIGNOR IGNAZIO'S "FLYING MAN."

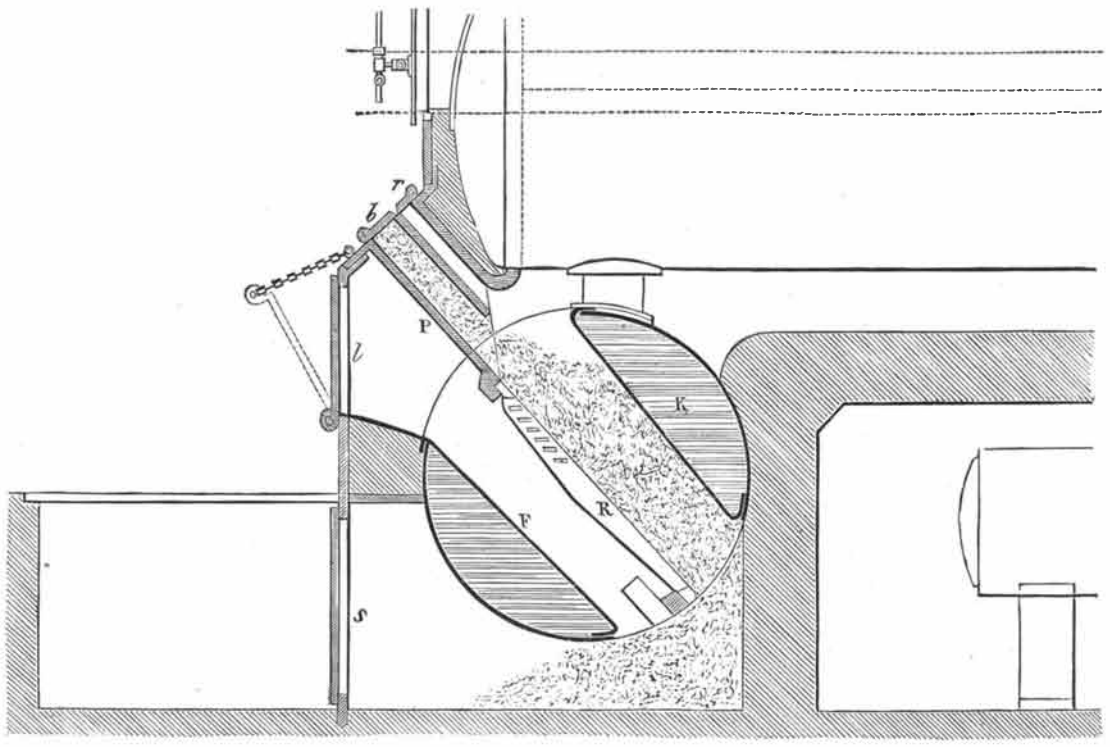
Signor Capretti Ignazio, of Milan, has recently added to the list of avatars with which attempts have been made to navigate the air, an apparatus which he designates the "Flying Man." Like his predecessors, he has chosen the wings and tail of a bird as models for his machine. Each wing is composed of sixteen pieces of cane, which are connected by sets of movable fans. The tail resembles a section of an umbrella. The canes in the wings are adjusted to a shell working on a universal joint, which in turn is attached to a framework that is strapped to the body. At the furthest stretch of the arm is a band ring, to which are bound sticks of cane connected with the larger ones on which the fan moves. There is also strapped upon the back of the wearer a large folded bag, which, by a simple movement, can be converted into a sort of parachute in case any portion of the flying gear gets out of order. By the arrangement of a large number of movable fans, the operator is relieved of a great amount of resistance which it would be natural to suppose the air would offer; and the entire apparatus is said to be readily manipulated by a cool-headed adventurer.



SIGNOR IGNAZIO'S "FLYING MAN."

NEW SMOKE-BURNING FURNACE FOR STEAM BOILERS.

The novel smoke-consuming furnace herewith illustrated is the invention of M. Ten-Brink, of Arlen, Baden, and is now in use on some 500 locomotives on the French Chemin de Fer de l'Est. The engraving, which we extract from the Belgian *Bulletin de Museé*, exhibits the application of the system to a simple cylindrical boiler with the heater, K, placed below, with its major axis at right angles and horizontal to that of the boiler. One or two furnaces, F, traverse the heater, making with the horizon an angle of about 48°. In these furnaces is placed the grate formed of the table, P, and bars, R, the latter resting on the table at one extremity, and at the other on a support riveted to the end of the furnace. The table has two lateral sides surmounted by a cover, so that a close four-sided box is formed upon the door and grate extremities. The front piece to which this box is attached is a plate of cast iron in which several different openings are made. The aperture, *s*, serves to remove the ashes, etc., and thus to facilitate the descent of fuel on the grate; a second opening, *l*, affords passage to the draught under the grate. Fuel is inserted through the door, *p*, and a hinged cover, *r*, admits air in order to insure the complete combustion of disengaged gases. The heater is connected to the boiler by short tubes through which the cooler water at the bottom of the generator descends into the heater while the steam formed in the latter passes up into the boiler through an annular space formed by larger tubes surrounding those above mentioned.



SMOKE-BURNING FURNACE FOR STEAM BOILERS.

The following figures show the results of a comparative test made between a boiler provided with this furnace and one having the ordinary plane grate. The trials lasted five consecutive days. Both boilers were alike and each had three heaters and two water tubes. The heating surface of the two principal boilers was 172 square feet 32 inches; of the two water tubes, 70 square feet, and of the three heaters 341 square feet 31 inches, or, in all 583 square feet 63 inches. Boiler I had a Ten-Brink furnace of 48 square feet 63 inches. Boiler II had an ordinary plane grate.

	I.	II.
Quantity of water vaporized	112640 lbs.	78100
Temperature of feed water	63·5° Fah.	63·5° Fah.
Water vaporized reduced to 32° Fah	109047·41 lbs.	77394·8 lbs.
Consumption of fuel	11825· "	11319· "
Ashes per 220 lbs. of fuel	20·24 "	23 98 "
Pure coal consumed	10738 "	10080 "
Vaporization per 2·2 lbs. of fuel	20·3 "	15· "
" " calculated by reducing water to 32° Fah	22·3 "	16·76 "
Water entrained by steam calculated by Hirn's method	4·5 per cent	4·4 per cent.
Temperature of gases in chimney	321·8° Fah.	390·2° Fah.

New and Remarkable Galvanic Battery.

In ordinary galvanic batteries the electric current results from the chemical action of a liquid acid upon a metal, but according to the invention of Mr. Paul Jablochkoff, of Paris, whose name has recently been mentioned in the SCIENTIFIC AMERICAN in connection with an improved electric light, the current is produced by the action upon carbon of a solid body in a state of fusion. Instead of taking a metal for the negative electrode of a battery—that is, the electrode which is consumed in the action—he takes coke or an artificial conglomerate of carbonaceous matter possessing the same qualities, and acts upon this electrode by means of nitrate of potash or of soda or of ammonia in a state of fusion. He prefers to employ the nitrate of soda on account of its cheapness.

The carbonaceous matter is acted upon by the molten nitrate in the same manner as zinc is acted upon by the different acids or salts in the ordinary batteries. As the second electrode, he places in the same liquid either platinum or other metals that are not acted upon by the liquid in the presence of carbon. The crucible itself, in which the nitrate is fused, may constitute the positive electrode. For introducing the carbon into the liquid, the former may have attached to it a metal rod which serves for attachment of the conducting wires, or he places a metal grating or perforated metal receptacle in the liquid in which the carbon is contained, such grating or receptacle being insulated from the crucible if this constitutes the second electrode. In the latter arrangement the carbon may be added from time to time, as in a furnace, in proportion as it is consumed.

For bringing the battery into action in the first instance, the nitrates may either be fused in advance in the crucible, and the carbon be then introduced, or the nitrate may be placed in the crucible in a pulverulent state, and the carbon be ignited and plunged into the nitrate, which will become fused thereby. While the battery is in operation, large quantities of gases are developed similar in their nature to those produced by the combustion of gunpowder. These gases, collected by any suitable arrangement, as, for instance, in a boiler or closed chamber, may be utilized as motive power, so that this improved battery serves as a source both of electricity and of motive power. By mixing various metallic salts with the nitrates, the double effect may be obtained of regulating the intensity of action of the battery, and of obtaining metallic deposits upon the positive electrode, as in the ordinary electroplating process.

According to one arrangement of batteries, constructed according to this invention, the crucible containing the nitrate and carbon forms the positive electrode, the carbon being suspended in the liquid nitrate in a wire gauze cylinder attached to a cross bar, the ends of which rest upon a ring of insulating material on the top of the crucible. The latter is closed in by a hinged cover having an aperture, to which is connected a pipe for conveying the gases generated to wherever required. According to another arrangement, the crucible is made of earthenware, glass, or other non-metallic substance, centrally within which is placed the wire gauze cylinder containing the carbon, and surrounding this is a metal cylinder constituting the positive electrode, or this may simply consist of a rod or bar of metal. If it be desired to employ the battery principally or entirely for utilizing the gases generated as motive power, the crucible or vessel containing the nitrate and carbon is closed at top, and is provided with a pipe leading to a boiler or closed vessel for collecting the gases under any desired pressure. The top or dome of the crucible may in this, as also in the previous arrangements, be provided with a hopper by a valve, through which carbonaceous matter may be introduced from time to time, and also with a second hopper for the addition of nitrate when required.

British Official Reports on the Philadelphia Exhibition.

The following are the classes treated of by Mr. Barlow, in this report: "Water Wheels, Water Engines, Hydraulic Rams, Windmills, etc." and "Apparatus for the Transmission of Power," "Shafting, Belting, Cables, etc," "Hydraulic Jacks, Presses, Elevators, etc.," "Pumps and Apparatus for Lifting and Moving Fluids."

In the first class, Mr. Barlow noticed an extensive display of turbines, which seem to have superseded water wheels and other water motors. There were also some ingenious contrivances for applying small amounts of hydraulic power. In the second class, leather belting occupied a prominent position from the extensive use made of it in the States as a transmitter. The Belgian hair machine belting is also noticed. Wire rope also was extensively shown, and there were some driving chains working over cogged chain wheels, and constructed so as to be detachable for lengthening or shortening, which attracted notice. In the shafting, the shafts made by a process of cold rolling afforded the greatest novelty. These are first rolled hot, then treated with acid to remove scale and oxide, and finally subjected to cold rolling in cast steel rollers. In the elevator class, a curious safety device was noticed. The lifting chain is a strong flat-linked endless chain, arranged so that it can only move in the direction of its length. If the chain breaks, the lower part below the carriage, being unable to move laterally in its groove, becomes a rigid support to the carriage. Among the pumps were some pulsometers and vacuum engines. The former are characterized as being cheap in construction and repair, but wasteful in steam from condensation. As the latter are intended to be worked by exhaust steam from other engines, all the work they do is so much utilization of waste power. Other pumps, hydraulic rams, etc., are also noticed.

Looking at the exhibits of the whole group, Mr. Barlow was struck by the great fertility of invention displayed in America, and the excellent workmanship. American machinery seems somewhat lighter than English, and therefore less steady and free from vibration. "The aim at improvement takes two different directions: one being that of obtaining simplicity and cheapness of construction, putting the cost of working as of secondary importance. The other being the endeavor to obtain high perfection in the details and great economy of working, treating the cost of construction as of less importance. The one, in fact, being aimed at cases where engines and machinery are employed for temporary purposes, the other directed to those cases where continuous working is the object."

The Machinery Hall, as a whole, gave "a high opinion of the mechanical skill of the Americans."

A Watch.

[Lines Printed on an old English Watch Card.]

Could but our tempers move like this machine,
Not urged by passion or delayed by spleen;
And true to Nature's regulating power
By virtuous acts distinguished every hour.

Then health and joy would follow as they ought
The laws of nature and the laws of thought—
Sweet health to pass the present moments o'er,
And involving joy when time shall be no more.

ASPHALTUM may be used to advantage in staining in imitation of hard woods.

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Inventions Patented in England by Americans.

From August 28 to September 11, inclusive.

BREECH-LOADING GUN.—A. J. Crocker, Providence, R. I.
BINDING WIRE.—S. G. Mason, Vicsburgh, Mich.
CONVERSION OF IRON ORES.—M. J. Hamilton, St. Louis, Mo.
LABELS.—A. Kimball, New York city.
LOOM.—W. Riding, Norristown, Pa.
PROPELLING CARS.—J. B. Tibbitts, Hoosic, N. Y.
REFRIGERATING APPARATUS.—G. C. Roberts (of New York city), London, England.
RESTORING CRAPE, ETC.—Eva B. Reid, New York city.
SEWING THREAD —A. R. Arnold, Newark, N. J.
SHOE STIFFENINGS.—D. Scrymgeour, Boston, Mass.
SPRING TRAP.—I. A. Paine, New York city.
TACKS FOR SHOE SOLES.—L. Goddu, Winchester, Mass.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MACHINE FOR BUNCHING HAY FOR FUEL.

Marcus E. Getter, Alden, Minn.—The box or frame of this machine is supported upon legs, and a shaft is journaled in the side of the box, and is provided with steel tines which extend horizontally through the box and project through a circular opening in the side of the box opposite that in which the shaft is journaled. Short tines are placed in altercation with longer tines, and both are tapered throughout their entire length. A semi-cylindrical presser is placed directly under and parallel to the tines, and is connected by a bar with a foot lever which is pivoted to the crossbar that connects the legs. A slide, moving in guides at the side of the box, closes the opening, and is notched to fit over the ends of the tines, and prevents the hay from escaping at the side of the box. The operation is as follows: Hay is introduced into the box as the tines are revolved, and as it is wound upon the tines the presser is thrown upward by means of the foot lever. This causes the hay to wind closely upon the tines. When the bunch is sufficiently large the slide is raised by moving the lever. The bunch is then discharged from the tines through the opening by throwing the forked lever forward.

IMPROVED APPARATUS FOR HEATING AND LIGHTING.

Charles Ritchie, Brixton, Eng.—The vapors arising from the combustion of coal gas are highly injurious to health, and greater in volume than is generally supposed, exceeding, as they do when condensed into liquid form, a half ounce to every foot of gas that is burned. These vapors contain sulphurous acid, carbon, and other deleterious matters, which, especially the sulphurous compounds, have great affinity for water, and may hence be gotten rid of by condensation. The object of this invention is to condense the vapors and separate them so far as possible from other products of combustion; also to heat and ventilate the apartment in which the gas is burned for illuminating purposes. Siphonic action results naturally from the arrangement of passages or flues so that the combined currents of heated air, vapors, and products of combustion from the gas flames at burners are curved downward and then upward through a long circuitous route, whereby the heat becomes mostly radiated or absorbed from the traveling vapors, and the vapors and gases, being rendered heavier than the air, fall to the bottom of the apparatus, where condensation takes place. The noxious substances are thereby eliminated, and the heated air and certain light products of combustion pass on into an apartment which is ventilated by the constant change of air without the delivery of noxious matter into the same.

IMPROVED BEDPIECE FOR CLOTH-PRESSING MACHINES.

Herman Springborn and Christian H. Baush, Holyoke, Mass.—The present invention relates to improvements in that class of cloth-pressing machines in which a pressing roller is fitted to a heated concave bed. The invention consists in a hollow bedpiece, made in two parts, and connected by means of dovetail projections and recesses, and having between them air spaces. The object of the invention is to provide a bed for cloth-pressing machines in which both heat and cold may be employed, so that the cloth may be both hot and cold pressed in passing over the bed. The side parts of the bed are made of cast iron or other suitable material, and are each chambered out or made hollow—one to receive a current of water, cool air, or other suitable medium for cooling the bed, and the other for receiving steam, or for containing a gas flame or other suitable heating medium. The parts are connected together by dovetail projections formed on one part and a dovetail slot formed in the other part, the side of which is cut away, forming air spaces that prevent the intercommunication of heat and cold. The parts are put together by sliding the dovetail projections of the one part into the dovetail slot of the other part. This arrangement permits of the expansion of one part of the bed independently of the other part, so that as one part of the bed is warmed and the other cooled, neither part will be strained. Steam is taken into one part through an aperture and the water of condensation is removed through another aperture, and cold water is taken one part through one aperture and escapes through the other aperture. Cloth, in passing over the concave surface of the bed, is first subjected to hot pressure between the roll and the bed, and is afterwards subjected to cold pressure beneath the same roll.

IMPROVED COTTON GIN.

Robert Dickinson, Darlington Court House, S. C.—This invention relates to cotton gins, and consists, first, in constructing the ribs forming the breast in pairs or gangs, for the purpose of allowing them to be secured firmly and substantially in their places; second, in flanges or fins fixed to the ribs, and so constructed and arranged that foreign substances cannot be brought in contact with the saw teeth; third, in clearing-brushes arranged between the saws and the brush cylinder, and receiving the saw teeth through them, for the purpose of preventing clogging and danger from fire, and also for the purpose of carding and straightening out the lint on its way to the brush cylinder. The saw shaft is journaled in boxes on the main portion of the frame, and is consequently detached from the driving shaft, and will not be thrown out of true thereby, nor caused to heat in its bearing. This arrangement prevents any grinding or rubbing of the saws against the ribs or bars, and lessens vibration and wear. Hitherto the ribs have been made separate. In this improvement they are constructed in pairs or gangs, for the purpose of more rigidly securing them to the end rails. Single ribs work loose, and have less bearing on their rails than the double or triple ribs, and are more liable to cause clogging. The ribs are all provided with flanges, which are constructed of an angular form, with the lower ends rounded and the upper edge sloping upward. These flanges serve as guards, and protect the saw teeth from contact with sticks, nails, matches, and other foreign substances which might be in the cotton. This brush cylinder is constructed in the usual manner, and its shaft is entirely independent of the saw shaft; consequently the latter will not be subjected to strain or wear, which is so objectionable in gins where the saw shaft and brush cylinder are geared or bolted together. The brushes are designed to extinguish fire which may take place, from any cause, in the gin, and they also operate to card and straighten out the lint on its way to the brush cylinder.

IMPROVED JACQUARD MACHINERY.

Warren P. Jennings, Brooklyn, N. Y.—This invention has relation to jacquard machinery, and the nature of the invention consists, first, in the employment of a cam wheel of peculiar construction, in combination with gearing and rotating arms, for giving more positive intermittent rotation to a card cylinder during its vertical movements; second, in combining a heater with the cards, which is so arranged that the latter are prevented from being injured by moisture in the air. A cam wheel communicates a positive rotary motion to the card cylinders, giving them one eighth of a revolution at each stroke, and bringing them into proper position at the termination of every ascending stroke. The movements are so direct and timed that there will be no tendency to displace the cards on the cylinders while bringing them successively into position for operation. The chain of cards is constructed in the usual well known manner, and near the guide roller, over which the cards pass to the cylinder, is arranged a heater, covered by a shield. This heater may be a perforated gas pipe, where it is desired to use gas jets, or a lamp or steam may be used where gas is not to be had. In damp weather cards absorb moisture and swell, so that they do not work true. To prevent this the heater is so arranged that the cards are kept dry.

IMPROVED MACHINE FOR PICKING STONES, ETC.

Charles Fuller, Little Marsh, Pa.—The object of this invention is to furnish an improved machine for picking, hauling, and delivering stone, manure, dirt, etc., which shall be simple in construction, effective in operation, and conveniently operated and controlled. The invention consists in the combination of the hinged crossbar and the U-rods, connected by crossbars with the frame work of the machine; in the combination of the adjustable crossbar and the guide rods with the hinged crossbar to which the U-rods are attached, and with the frame of the machine; in the combination of the lever provided with the slotted curved arm and the pin with the frame of the adjustable crossbar and the hinged crossbar, to which the U-rods are attached; in the combination of the notched fulcrum bar with the crossbar of the U-rods, and with the axle of the carriage; in the combination of the ratchet bars, the pawls, the rod, and the lever with the crossbar of the U-rods, and with the frame of the carriage; and in the combination of the scraper provided with the keepers and the flange socket with the lower arms of the U-rods. When the machine is to be used for handling dirt and other fine substances a scoop or scraper is placed upon the lower arms of the U-rods. The scraper has two or more keepers formed upon its bottom to receive two or more of the rods, and thus keep the rear part of the scraper in position.

IMPROVED WINDMILL.

Oscar B. Fuller and Leonard A. Fuller, Mount Pulaski, Ill.—The object of this invention is to furnish an improved windwheel, which shall be simple in construction, inexpensive in manufacture, reliable in operation, and easily controlled. The wheel is formed by attaching wings to the radial arms of a hub, which revolves upon a journal formed upon or attached to the outer end of a bar or beam. To the inner side of the wheel is attached an eccentric flange to receive the forked outer end of a lever. The lever is pivoted to a short fulcrum post, the lower end of which has a T formed upon it to fit into a T groove formed in the plate attached to the bar or beam, so that the fulcrum point may be adjusted as required. To the inner end of the lever is attached the upper end of the rod, which passes down through the tube and hollow stop, and from the lower end of which motion is taken to the machinery to be driven. Upon one end of the shank of the vane is formed an arm which strikes against a shoulder formed upon the side of the inner end of the bar or beam. By this arrangement the vane cannot turn out of line with the bar or beam in one direction, but may turn in the other direction into a position at right angles with said bar or beam. A special advantage of this improved windwheel is that the lever so greatly increases the power of the wheel that it may be used for raising water from deep wells while using a small wheel, which could not be done with the old construction, as the resistance of the pump was so great that the wheel had to be made very large, and on this account was very expensive in construction, and very liable to be broken by a heavy wind.

IMPROVED DRILL CHUCK.

Henry B. Beach, West Meriden, Conn.—This invention relates to an improved chuck of simple and effective construction, which gripes the object with considerable power as the same is inserted into the chuck, passing nearly through the entire length of the same, so as to obtain a greater bearing surface, and hold the object rigidly and without vibration. The solid center piece is made in one piece with the spindle to be placed in the arbor of the lathe, or to be screwed to the face plate. The center piece is provided with an exterior screw thread, and with guide recesses for the jaws, which are side grooved to receive tenons of the part, so that no vibration of the ends of the jaw may be produced, and are pressed in outward direction by spiral springs resting between the center piece and in sockets of the rear ends of the jaws. The jaws are moved inward by an outer cap that turns by an interior thread on the center piece. The cap bears, by its conical front end, on the corresponding tapering jaws, exerting a uniform pressure upon the outer tapering surface of the same, so as to accurately and steadily draw in the jaws on screwing back the cap over the center piece, the springs returning the jaws when the pressure is relaxed by the forward screwing of the outer cap. The chuck is readily adjusted to the work by turning the cap forward or backward on the center piece, the jaws clamping by their interior faces the work with great power.

IMPROVED BULL WHEEL FOR DERRICKS.

William J. McKee, Petrolia, Pa.—The object of this invention is to furnish an improved bull wheel which shall be stronger, and at the same time lighter, than wheels constructed in the usual way. The outer ends of the arms or spokes are notched and slotted, so that the segments of every other one of said layers may pass through the ends of the said arms or spokes, and the segments of every other layer may abut against said arms or spokes. By this construction the strain will come right over, and will be distributed among, the arms or spokes of the wheel, and a lighter and stronger wheel will be produced. The face of one of the wheels is grooved to receive the driver or tug rope, and the other has a wide flat groove formed upon it to receive the brake strap or band.

IMPROVED MIDDLINGS SEPARATOR.

Myron H. Alberty, Cherokee, Kan.—The object of this invention is to purify middlings and separate the fuzzy and branny particles, and at the same time separate the heavier from the lighter middlings, by subjecting them to currents of air while passing through the machine. The invention consists in the combination of a series of air passages provided with gates at their outer and inner ends, with a blast fan and a set of air chambers; in the combination, with the blast fan and the inlet air passages, of adjustable riddles, an exhaust or settling chamber, and an exhaust fan. The middlings are introduced through an opening in the case into the chamber and fall upon inclined boards, and pass through an opening between said boards into the first air chamber, where they are met by one or more currents of air from one or more of the passages, and by currents of air through the holes in the first riddle, and the fuzzy or branny particles are carried over the upper end of the riddle into a chamber. The heavier middlings fall upon the riddle and pass down through its holes against the air passing through said holes into the second air chamber, where they are met by a current or currents of air. The fuzzy and branny particles are again blown off by the air from the passages and the air passing up through the holes in the second riddle, and are driven over the upper end of the said riddle into a chamber. The heavier middlings fall upon a riddle and pass through its holes into the third air chamber, where they are again met by a current or currents of air, and the fuzzy and branny particles that may still remain are driven over the end of the inclined board into a chamber.

IMPROVED SPINDLE, BOLSTER AND STEP FOR SPINNING MACHINE.

John T. Beall, Petersburgh, Pa.—This invention relates to certain improvements in the construction and adaptation of the spindle, bolster, and step of a spinning machine, designed to secure automatic lubrication, the best bearing surfaces for the parts, and to prevent the tendency of the oil to exude at the joints and spread over the entire surface of the same. The invention consists mainly in arranging the bushing in the upper end of the bolster slightly below the upper edge of the bolster, so as to form a cup or recess to receive the oil, which has a tendency to rise upon the spindle and spread upon the outside of the bolster, and in surrounding said upper bushing with a packing of fibrous material which retains and filters the oil and resembles that which accumulates in the cup or recess. It also consists in the particular arrangement of parts whereby the two bearings of the bolster and the toe of the spindle in the step are all oiled at a single joint instead of permitting the spreading of oil upon the outside surfaces.

IMPROVED TREADLE-OPERATED CONFLUENT PUMP.

Richard H. Schenck, New York city.—This invention relates to an improved suction and force pump of effective construction, that is operated by the feet, and arranged to throw a uniform stream of water; and it consists of two cylinders with alternately treadle-acted pistons, that are connected by a chain or rope passing over a central pulley between the same, each stroke of the pistons producing the induction and eduction of the water, in connection with suitable valves and channels connecting the cylinders, suction and discharge pipes. The stroke of each treadle produces the lowering of one piston and the raising of the other piston, the pistons exerting thereby, simultaneously, a suction and force action, so as to draw in the water by the induction pipe and discharge it by the eduction pipe. The eduction pipe takes up the water in the air chamber and passes out at the top of the same, the air in the air chamber regulating the flow of water and keeping it up in uniform manner.

IMPROVED SCRAPER AND DITCHER.

Joel Rice, Liberty, Mo.—The object of this invention is to furnish an an improved machine for opening ditches, grading and repairing roads, grading yards, lawns, etc., and for various other uses where earth is to be moved short distances. The sides of the ditcher are jointed together at one end, set at an angle to each other, and connected adjustably by means of curved overlapping arms which are perforated to receive locking pins. Said arms support a platform, upon which the driver is to stand or sit, when he desires to add his own weight to that of the scraper. To the bars, at their angle, is attached a notched bar to which the draught is applied. The outer side of the side bar is made straight, and is designed to rest against the land side of the furrow opened by the plow which the scraper is following, and the outer side of the side bar, that pushes back the dirt, is slightly concaved. With this construction the scraper may be used to throw the dirt to the right hand or to the left, as may be desired, or in following a left or right hand plow, or to throw the dirt to the same side while passing back and forth along the same furrow in opening a ditch, by using it with one or the other side upward, as may be required, to throw the dirt in the desired direction.

IMPROVEMENT IN SECURING HANDLES IN TOOLS.

Lazare Landecker, San Luis Obispo, Cal.—The object of this invention is to furnish an improvement in securing handles in hammer heads, and in all other tools in which the handles are inserted in eyes, by means of which the handles will be held firmly and securely in place. The invention consists in the teeth, points, or other projections formed upon the surface of the eye of a tool, to be forced into the handle as it is spread by the wedges, for securing said handles immovably in said eye. The projections also prevent the handle from turning in a round eye, and hold it immovably in place.

IMPROVED HYDRAULIC CEMENT.

James C. Gostling, New York city.—This invention relates to an improved hydraulic cement; and it consists in a composition formed by mixing together calcareous shell marl, containing from seventy to eighty per cent of carbonate of lime, silicious clay, pozzolana or anthracite coal ashes, and ribbon stone containing a large percentage of magnesia. When sufficiently dry, place it in a kiln, in alternating layers with coal or coke, and burn it to a moderately hard clinker. After burning, grind it, by means of burr stones or other suitable machinery, to a powder sufficiently fine to pass through a sieve of fifty meshes to the square inch.

IMPROVED TYPE-DISTRIBUTING MACHINE.

Robert T. P. Allen, Farmdale, Ky.—This invention consists in the construction and combination of devices whereby the types (composing the column or page of matter to be distributed) are individually and successively forced into spring clamps, or holders, that are carried by a rotating wheel, and by such holders delivered to automatic releasing mechanism, and distributed into separate receptacles. For details, see patent.

IMPROVED ROAD SCRAPER.

Samuel Pennock, Ithaca, N. Y.—This invention relates to machines for scraping and leveling roads, and it consists in a scraper supported by a suitable frame carried by wheels, and adjustable as to its height, and in a toothed bar carried in front of the scraper, to be used or not, as occasion may require. By operating one or the other lever the end of the scraper bar may be raised, so that by driving up on one side of the road and down on the other the road may be ridged or rounded, as may be desired, or by arranging the scraper bar in a horizontal position the road may be made level. The bar is adjusted so that its teeth cut away the projecting and uneven portions of the surface before it is scraped.

IMPROVED DIRECT-ACTING FORCE PUMP.

John K. Van Pelt and Washington Lee, Texarkana, Ark., assignors to themselves and William H. Elliott, of same place.—This invention has reference to an improved direct-acting force pump of extremely simple and durable construction, that is adapted particularly to mining and other purposes, as no valves are used and no parts are liable to get out of order by sand and grit. The invention consists of direct-acting plungers that force the water from the cylinders, having supply holes through bottom channels to a discharge pipe having a swinging or sliding cut-off that alternately establishes and interrupts communication with the cylinder and channels. The top part is provided with cylinders and plungers, sliding therein, and being operated by plunger rods and a fulcrum lever. The water enters the cylinder through supply holes at both sides, and is forced by the direct action of the plungers down into the water channels of base part and into a connecting chamber, with which the discharge pipe communicates. A swinging and balanced cut-off is arranged in connecting chamber at the foot of discharge pipe, and carried by the alternating action of the plungers from one side to the other, so as to rest on seats of chamber. The cut-off produces the connection of the cylinders with the discharge pipe at the descent of the plungers, and forces at each stroke the water through one of the channels into the discharge pipe. The pump works in simple and effective manner, without valves or suction, and is readily filled at each upward stroke of the plungers as it is submerged in the water. When the motion of the plunger is stopped the water falls back into the water chambers, and remains cool, without being exposed to freezing as in the valved pumps, in which the water is sustained above the plungers. The pump is not liable to become filled with sand or sediment, so as to get out of order, being thereby of special advantage for pumping gritty or impure water.

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IMPROVED STREET-CAR ENGINE.

Francis V. Mathews, New Orleans, La.—This invention relates to motors for driving street and other cars, and it consists of a pair of oscillating steam cylinders supported under the car by the truck, and provided with vertical shafts upon which are placed worm wheels that engage with wheels on the car axles. The frame of the engine is attached to and supported by the truck frame of the car. The cylinders are oscillating, and with their upper trunnions journaled in a support, and the lower trunnions are journaled in the main frame. These cylinders are provided with central ports at their ends, and with a face that is fitted steamtight to the part of the engine frame. Between the ports there is an exhaust port and a valve capable of covering either of the ports, and the exhaust port is pressed against the valve seat by a spring. The valve is provided with a rod that is connected with an arm on a rocking shaft that is connected with a suitable lever in the car by which it is moved. Vertical shafts are journaled in the frame and provided with crank disks at their upper ends, from which the crank pins project. The piston rods of the cylinders are connected with the crank pins. Upon shafts are endless screws or worms, which engage the wheels on the car axles. The engines run in opposite directions, which gives to both axles a motion in the same direction, the screws being placed on opposite sides of the axles. The valve is placed so that it covers one of the ports and the exhaust port when steam enters the exposed port and drives the engine, the used steam escaping through the covered port and the exhaust port. When it is desired to reverse the engine the valve is moved so as to admit steam through what was before the exhaust port, and to permit the used steam to escape through the other port. The crank pins may be connected by a rod when the cylinders will assist each other. The frame of the engine is constructed so as to inclose the cylinders, worm wheels, and other working parts of the engine, so that none of the parts are exposed to dust, and all noise is confined, so as to be unobservable.

IMPROVED FIRE ESCAPE.

Henry Elbe, Niagara Falls, N. Y., assignor to himself and Adolph Goldsmith, New York city.—This invention relates to means for removing persons and furniture from the windows of a building which is on fire. To the wall of a building a rail or track is strongly secured by means of brackets. This rail is set off a little from the wall, and, if desired, it may be inclosed inside of the cornice or a receptacle especially provided for it. A car is constructed to move up and down the track. To this car are attached chains of sufficient length to be controlled by persons on the sidewalk below. The chains are intended to enable a person to move the car at any desired point on the rail. The ladder is made of metal, and the side bars of short links pivoted together, which will allow the ladder to be rolled up when not in use. In combination with this apparatus is used a fender or shield, made of sheet metal plate, of suitable size to cover one or more windows, and it is perforated at different points for allowing the nozzle of a hose pipe to be inserted through it. The fireman will thus be protected from flame and smoke while playing on the fire.

IMPROVED HORSE POWER.

Edwin R. Lancaster, Alum Mills, Va.—The object of this invention is to furnish an improved horse power which shall be so constructed as to economize space without sacrificing power or effectiveness, and which shall be simple in construction and convenient in use. To the base frame of the machine is attached a large internally toothed gear wheel, the upper side of which is made wide and smooth, to serve as a way for the small wheels or rollers, pivoted to the corners of the frame. To the center of the frame is attached a post, the lower end of which revolves upon a pivot attached to the center of the frame. A small gear wheel meshes into the teeth of the large gear wheel. Another shaft revolves in bearings attached to one end of the frame, and to its upper end is attached a large gear wheel, the teeth of which mesh into the teeth of a small gear wheel attached to the upper end of the shaft, which revolves in bearings attached to the middle part of the frame, and to it is attached a large gear wheel, the teeth of which mesh into the teeth of a small gear wheel attached to another shaft, which revolves in bearings attached to the frame, and to its upper end is attached a grinding mill, which is thus carried around by and with the frame; no more space will be required than enough for the driving mechanism, and a neat and compact machine is produced. By this construction the machine will be evenly balanced, so that it will run steadily and easily.

IMPROVED CONNECTING ROD.

George W. Wilks, Roberson Fork, Tenn.—This invention consists in the arrangement in the straps of a connecting rod of side pieces between which are placed boxes, which are so proportioned that their surfaces that come into contact are reduced to a knife edge to admit of adjusting the boxes without filing, so that they may be forced together by the screws as the box becomes worn, and the necessity of filing the boxes is avoided. By means of this improvement the boxes of a connecting rod may be accurately adjusted without removing and filing them, and when adjusted cannot become accidentally loosened or disarranged.

IMPROVED WASHING MACHINE.

James H. Calvert, Princeton, Ky.—The object of this invention is to furnish an improved washing machine which shall be simple in construction, convenient in use, and effective in operation, washing the clothes quickly, thoroughly, and without injuring them. The invention consists in the combination of the crossbars, the pivoted bent levers, the connecting rods, and the springs with the suds box and the platform attached to said suds box, to form a yielding bed for the clothes while being operated upon. By this construction the clothes, while being operated upon, will be supported by a yielding bed, which will adjust itself to the varying thickness of the clothes being operated upon, so that the clothes may be operated upon evenly by the washing cylinder, thus protecting them from being cut or injured.

IMPROVED DOUBLE ACTING PUMP.

Riley I. Knapp, Guilford, Ill.—The object of this invention is to provide a simple and efficient pump that may be used either as a lift or force pump. To the cylinder a piston is fitted which is attached to parallel rods. This piston is provided with the usual leather packing, and with a central opening that is closed by a valve. In the cylinder a tubular piston is placed, which is provided with a valve and packing. To this piston, rods are attached which extend upward, and are pivoted to a lever that is pivoted to the standard. The piston tubular is fitted to a stationary hollow piston, which is attached to the standard by means of a strap. This piston is provided with packing and a valve, and to its upper end a pipe is attached. This hollow piston serves as an air chamber in equalizing the flow of water through the pipe.

IMPROVED BALING PRESSES ON WHEELS.

Michael McCarty, Pueblo, Col.—The object of this invention is to furnish an improved baling press, which shall be simple in construction, convenient in use, strong and durable, and so constructed that it may be readily moved from place to place. The baling box is made in two equal parts or halves connected together, held in position and strengthened to withstand the outward pressure of the bale while being compressed by three iron bands. The rear end of the baling box is closed by a door, which serves as a stationary follow block, and is hinged at its lower edge to the bottom of the box. The material to be pressed is introduced through a door formed in the forward part of the top of the baling box. A crossbar is attached to the outside of the movable follower, the ends of which project so as to pass through the spaces between the parts of the box, and to the projecting ends are attached the forward ends of rack bars, which pass back along the sides of the box. The racks are drawn back to compress the bale by gear wheels which mesh with them, and with which are rigidly connected the wheels or pulleys around which are wound, and to which are attached, the draw ropes.

IMPROVED TRICYCLE.

Matthew E. Croft, Horicon, Wis.—The object of this invention is to furnish an improved tricycle designed for use by mechanics and others for going to and from their places of business, by merchants and others for sending small parcels from one place to another, and by youths and others for amusement and exercise, and which shall be simple in construction and easily operated. The invention consists in the combination of the arched bars, the block, the seat, the cord, the stirrups, the rods, and the stay bars with the wheels, the axles, the tubes, and the bolster. The rear ends of two arched bars are bolted to the end parts of the forward bolster. The arched bars incline toward each other. so that their middle parts may be near each other, and to said middle parts is secured a block, which gives strength and rigidity to the bars, and to which is secured the seat or saddle upon which the rider sits. Over the forward part of the seat passes a cord, to the ends of which are attached stirrups to receive the rider's feet. To these stirrups are pivoted the rear ends of two rods, the forward ends of which are pivoted to the forward axle, near its ends, so that the rider can guide and turn the machine with his feet. The rider propels the machine by means of two rods which he holds in his hands, and which he presses against the ground. In starting, the rider presses both rods against the ground at the same time, but after he has got up enough motion to give momentum to the machine he can use the rods alternately.

IMPROVED MACHINE FOR SEWING BUTTONHOLES.

Richard M. Melhuish, Hoxton, Eng.—This invention relates to mechanism adapted for sewing machines of the Thomas or Howe type, for the purpose of sewing straight buttonholes and fancy stitching. By this invention this is accomplished with ease and rapidity, it not being necessary to turn the fabric round in order to work the two edges and finish off the ends of the buttonhole. The mechanism is for imparting to a movable cloth plate, upon which the work is clamped, a vibrating to and fro motion across the line of the hole, and also a traversing motion in the direction of the hole to feed the work as required. In sewing a buttonhole two parallel lines of stitches are made, the vibrating feed plate being caused to traverse first in one direction and then in the other by turning round a cam, each end of the intended buttonhole being barred as the needle arrives thereat, after which the hole is cut.

IMPROVED DEVICE FOR LOWERING FLUIDS INTO OIL WELLS.

Sebastian A. Fithian and Isaac N. Fithian, Karns City, Pa.—The especial object of this invention is to furnish an improved device for lowering fluids into the bottom of oil wells to cleanse them from obstructions, open the crevices, soften the paraffine so that it can be pumped out, etc., and which shall be simple in construction, convenient in use, and effective in operation. The invention consists in the combination of the barrel provided with the bail, the bottom at a little distance above its lower end, and the perforations in its sides below said bottom, the single or double valve, the spring catch, and the closely fitting cover. When the retaining valve is open the closing valve rests against and closes the lower end of the barrel, so that the fluid contained in the barrel will be forced out through the holes formed in the sides of said barrel below the bottom, and will thus be forced against and clean the sides of the well.

IMPROVED PISTON PACKING.

Isaac H. Congdon, Omaha, Neb.—This invention relates to an improved piston packing, by which the packing rings are evenly pressed against the cylinder, so as to wear in uniform manner; and the invention consists of a solid and annularly grooved ring resting against the lugs of the piston head, and having cylindrical pockets in which adjustable spiral springs are placed that press against an inner sectional ring and outer sectional pack ing rings. The packing is specially adapted for locomotive and stationary engines, and is cheaper than the semi-elliptic springs and brass packing in use. The pressure of the springs adjusts itself as the packing rings wear off, the springs being readily reset by taking out the follower bolts and head and turning the set bolts to the required degree of tension, the follower being readily replaced without interfering with the packing rings, as they remain in the solid and circumferentially grooved ring.

IMPROVED GRAIN SEPARATOR.

Reuben Sprenkel, York, Pa.—The action of an oscillating rocker, made of longitudinal slots on the carrier, shakes the grain in effective manner out of the straw as it is conveyed up by the carrier, the grain being collected below the carrier in any suitable manner. The carrier shafts run slower than the rocker operating shaft, giving thereby the rocker a chance to take out all the grain. The straw passes slowly over the machine, being thoroughly agitated by the quick beats of the rocker, without throwing any grain off the shaker. The machine runs without jarring, and takes the straw as fast as it is fed from the cylinder, so as to obviate the choking of the same. The shaker is secured by end hooks to eye bolts of the thrasher, and readily connected or detached from the same, it being also so supported as to be raised or lowered at the upper end to provide for the condition of the straw.

IMPROVED STUMP EXTRACTOR.

Charles Tener, New Market, O.—This invention relates to machines which are designed for extracting stumps and stones, and the nature of the invention consists in a portable frame, which can be taken apart or erected at pleasure, and which affords a substantial support for two rack bars, spring pawls, a vibrating actuating lever, and a lifting link. A strong timber is secured midlength of beams, and constructed with openings through it to receive two rack bars, the teeth of which are pitched forward. The lower ends of these bars are slotted and pivoted to a long lever, which is made of sections secured together so that they can be readily detached. The operation of the machine is as follows: The link is made fast to a stump, and the lever is vibrated, which gives alternate upward movements to the two ratchet bars, the pawls holding them firmly after each upward stroke.

IMPROVED APPARATUS FOR STRETCHING FELT JACKETS FOR ROLLERS IN PAPER MACHINES.

Luther Cole, Corinth, N. Y.—This invention relates to apparatus for stretching felt covers for couch and other rolls in a paper machine, and it consists of two tapered bars and two oppositely arranged wedges placed between the tapered bars, and operated by a spindle having cut upon it a right and left hand screw thread for moving the wedges simultaneously in opposite directions, so as to spread the tapered bars upon which the jacket is placed. The felt jacket to be stretched is drawn over the bars when the instrument is contracted. The bars are spread by drawing between them the wedges by turning the threaded spindle. The bars, the outer edges of which are parallel, stretch the jacket evenly and uniformly throughout its length.

IMPROVED SAW FEEDER.

James G. Cofman, Pierpont, Mich.—This invention relates to devices which are designed to hold a hand saw down to its work during the operation of cross-cutting logs. The nature of the invention consists in combining, with a spike, an adjustable spring roller and one or more dogs, so arranged that, when the spike is driven into the ground alongside of a log, and the latter firmly secured thereto, one man can conveniently manage a hand saw in the operation of cross cutting. This roller is arranged a little to one side of the spike, and presses upon the bowed back of the saw, holding it down to its work and guiding it. The sawyer regulates the pressure of the roller on the saw by means of a crank and its attachments, which are just in front of him while at work. The spike is driven into the ground alongside of a log, the latter is firmly secured to the spike. The saw is then started into the log, and the roller adjusted down upon it, and kept down with the required pressure during the entire operation.

IMPROVED DOG FOR SHEET-METAL ROLLING MILLS.

Edward C. Hegeler and Frederick W. Matthiessen, La Salle, Ill.—This invention relates to the dogs (so called) that are placed at the rear side of the rolls used in the manufacture of sheet metal, and it consists in a jointed dog, provided with friction rollers, and with a tail piece or lever that sustains the weight of the dog, and also any pressure that may be exerted upon it by the sheets of metal passing through the rolls. A nose piece is jointed to the front end of the casting and rests upon the roll. The sheet metal, as it passes from the rolls, is received by a nosepiece, and directed so that it will pass over the roll to the table of the rolling mill. The weight of the casting and friction rolls, and the pressure of the sheets, are sustained by the tail piece, and only a part of the weight of the nose piece rests upon the roll.

IMPROVED MACHINE FOR WELDING TUBES.

John French, South St. Louis, Mo., assignor to himself and James W. Hill, of same place.—The flue or tube to be welded is placed upon a mandrel which rests in semicircular notches in the ends of the arms of the holder, which is secured to the base, and the notch in its inner arm is made the same size as the cavity of the die, and is beveled so that, when the end of the tube or flue is placed upon the forward end of the mandrel and is slipped back, it can readily pass through the said notch. The forward end of the mandrel is tapered so that the flue or tube can be slipped upon it without its being necessary to take hold of the said mandrel. Upon the mandrel is formed, or to it is attached, a collar which is placed between the arms of the holder to prevent the mandrel from getting out of place.

NEW AGRICULTURAL INVENTIONS.

IMPROVED SULKY PLOW.

Roberson A. Renfro, Rockwall, Tex.—The object of this invention is to furnish an improved sulky plow, which shall be simple in construction and convenient in use, and which shall be so constructed that it may be adjusted to run level when used as a breaking plow, with one wheel in the furrow, and when used as a cultivator with both wheels upon the surface of the ground. The axle at the inner end of each journal is bent twice at right angles, the right-hand crank thus formed having a drop of six inches, and the left-hand crank having a drop of four inches. The right-hand wheel is made four inches more in diameter than the left-hand wheel, so that the frame of the sulky may be level when the right hand wheel is running in a furrow four inches deep. When the machine is to be used as a cultivator the wheels are exchanged, and the frame will then be level, with both wheels running upon the surface of the ground. The plow beams may be provided with breaking plows or with cultivating plows, according to the kind of plowing required to be done, and one or more plow beams may be used, as may be desired.

IMPROVED CALF MUZZLE.

Henry W. Fuller, Seneca, Kan.—This invention has reference to an improved anti-sucking bit and muzzle for calves, which may be attached without straps, so as to form an effective weaner; and the invention consists of a spiked and jointed noise piece, attached to a side wire that is extended in bow shape over the head, and connected by an anti-sucking bit of spiral wire. The ends of the sections that enter into the nostrils are made of ball shape, and press lightly, without hurting the calf, on the nose by the flexible joint of the sections. The nose piece is provided with spikes, attached to the sections, that extend at right angles from the nose piece in forward direction. The bottom spikes act as guards to prevent the teat from coming into the mouth, while the front spikes are pricking the cow, so that she does not allow the calf to take hold of the teat.

IMPROVED ROTARY CHURN.

Jacob Wolf, Henderson, Minn.—This invention relates to rotary barrel churns, and the nature of the invention consists in a novel mode of applying the dashers inside of the churn barrel, whereby they can be easily removed for cleaning. There are three sets of dashers inside of the barrel, arranged equidistant apart. Each set of dashers consists of a bar, having broad tapered blades fixed into it. The bars are notched at their ends to receive shouldered cleats, and by means of turn buttons, pivoted to one of the blades, the bars are rigidly held in their places. Holes are made through the end and side of the barrel, and provided with plugs for drawing off fluids.

IMPROVED TOBACCO HARVESTER.

Horace Janes, Knobnoster, Mo.—The object of this invention is to provide an instrument for splitting and cutting tobacco stalks at one operation. The manner of using the instrument is as follows: The handle and the short arm of the lever are grasped by the hand, and the knife is forced downward through the stalk, splitting it as far as may be desired. The edge of the chisel stands in the same direction as the knife, and does not interfere with the leaf. After the stalk is split the knife is withdrawn by closing the short end of the lever and the handle together, which operation also turns the chisel a quarter of a revolution, bringing it into position to cut off the stalk. By an endwise movement of the chisel the stalk is easily severed.

IMPROVED HARVESTER RAKE.

George H. Goetze, Lake Creek, Mo.—The object of this invention is to furnish an improved machine which shall be so constructed that it may be readily adjusted for use as a reaper or mower, as required, and which shall be provided with an adjustable rake for sweeping the cut grain from the platform. The two rakes may be adjusted wider apart or closer together, according to the length of the grain, by adjusting bearing blocks upon the rake shaft. The rake shaft is secured adjustably in place in its bearings by one of bearing blocks, and by a collar secured to the shaft by a set screw. When the machine is to be used as a mower, the reel and the rakes and their attachments and the platform are detached, and the cutter bar is shortened to reduce it to the proper length. The center bar is made n two parts, the adjacent ends of which are halved and bolted or otherwise secured to each other, so that it can be readily extended to adjust it for cutting grain, and shortened to adjust it for cutting grass.

IMPROVED ROTARY HARROW.

Cornelius Watson, Yanceyville, N. C., assignor to himself and James G. Gunn, of same place.—The object of this invention is to furnish an improved rotary harrow, which shall be simple in construction, strong and durable, effective in operation, and inexpensive in manufacture, being so constructed that it need not cost any more than an ordinary harrow. To the lower side of the beam is secured a plate, to the center of which is attached an axle which has a collar formed upon it at the lower side of the plate to prevent the upper end of the hub from rubbing against the plate. The axle passes down through a box inserted in the hub to prevent wear, and the hub is secured in place upon it by a washer and pin. To the hub are attached radial arms, the outer parts of which are held in position by a rim. The forward ends of the handles are inserted in a keeper attached to the beam, and are further secured in place by pins, which pass through them and into the beam, and which are covered by the keeper. By withdrawing the pin and detaching the keeper the handles and their standard may be detached when desired.

IMPROVED ADJUSTABLE WHEEL CULTIVATOR.

David Archer, Jr., Brier Hill, N. Y.—The object of this invention is to furnish an improved cultivator which shall be so constructed that it may be readily adjusted to work at any desired depth in the ground, which may be raised above the ground for convenience in passing from place to place, and which shall be simple in construction, convenient in use, and effective in operation. The frame of the cultivator is of a V form, the draft being applied at the apex. The frame is supported at front and rear on caster wheels, the supporting sides of which are so arranged that by raising a

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depressing lever attached to the frame work the body of the cultivator containing the teeth is depressed or raised as it is desired to have the teeth work deeper or lighter in the ground. The retention of the frame containing the teeth at the proper elevation is easily effected by inserting bolts or pins in upright bars having corresponding holes, against which the levers have a bearing.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED DUMPING WAGON.

Thomas C. Duncanson, Jeffersonville, O.—The object of this invention is to furnish wagons which shall be so constructed that the box may be tilted to dump the load by the movement of the team, and which shall be simple in construction and convenient in use. When the load is to be dumped the wagon is brought to the desired place, a lever is operated to withdraw the bar from the king bolt, the brake is applied to the rear wheels, and the team is backed. This causes the forward part of the wagon gearing to move back towards its rear part, the box moving back upon rollers. As the center of gravity of the box passes the bolster the ox tbilts, and the load is dumped. A hook prevents the box from sliding off the bolster. The box may then be tipped back, the team started forward, and the lever operated to lock the king bolt in place when it reaches the forward end of the slot in the reach. The end board is then secured in place, and the wagon is ready to receive another load.

IMPROVED HOOD FOR FIREPLACE.

Herbert Clayton, Lexington, Ky.—The object of this invention is to furnish an improved device for attachment to fireplaces to prevent smoke, heat, and ashes from rising up about the mantlepiece, and at the same time to reflect the heat downward and outward into the room. The fireplace is provided with a hood and reflector, which may be made of any sheet metal that will take a polish and reflect heat. The hood is arched, and its rear edge is concaved to give the reflector an upward inclination. The surface of the reflector may be either plain or corrugated, and is so arranged as to reflect the heat below the eye while throwing it out into the room. It is so formed and arranged as not to be in the way of those performing any operation about the fire.

IMPROVED TIRE TIGHTENER.

Stephen Stout, Tremont, Ill.—This invention relates to a simple and readily operated device for expanding the fellies and securing them tightly to the tire, and it consists of a standard or arm resting on the hub, and carrying, in slots and crosspin, a tube with top support bearing against the felly. The tube is spirally notched at its lower end, and turned by a wrench on the pin, expanding the felly, and admitting the springing in of the split leather rings around the tenons of the spokes. On to the tube is shrunk or otherwise attached a fixed nut, by means of which the tube may be turned by a wrench, so that its lower spirally notched end, which is seated on the crosspin, is raised thereon, and forces its upper support against the felly, expanding the same and pressing it tightly against the tire, so as to admit the springing on of split leather rings to the tenon of the spoke, and thus secure the tight fitting of the tire.

IMPROVED WAGON BOX CORNER.

William B. Botsford, Mill Port, N. Y.—The object of this invention is to furnish an improved metal corner for wagon, buggy, and sleigh bodies or boxes, and seats for trunks, chests, furniture, etc., which shall be simple in construction, strong, durable, inexpensive in manufacture, neat in appearance, and easily applied. The base or sill of the box is made hollow to receive the ends of the side and end sills of the box. Upon the upper side of the base or sill is formed a rib or lugs, to the opposite sides of which are secured by rivets, screws, or bolts, the ends of the side and end boards of the box. The space between the two plates is filled with wood, cut or bent into the required form.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED REFRIGERATOR.

Edward Clark, New York City.—The object of this invention is to improve the construction of refrigerators, ice boxes, ice houses, and other receptacles for ice, or for things to be kept cool so as to make them more convenient in use and more effective in operation, while at the same time being less expensive in manufacture. The ice chamber is placed in the middle part of the box and provided with the openings in the lower, middle, and upper parts of its sides, and with the doors at its top and at the lower part of its front. The case has an open bottom, and the refrigerator box is provided with a door in its top with a detachable milk vessel. It is lined with a non-conducting lining consisting of charcoal, hydraulic cement, sawdust, plaster of Paris, sand and water, mixed in about the proportions specified.

IMPROVED STOP-COCK.

Samuel M. Denniston and Charles Simmons, Prescott, Arizona Ter.—This invention consists in the combination with a stop-cock of a split-threaded tube having a T-shaped head, which may be inserted in a hole in a can, and upon which the stop-cock may be screwed. The object of this invention is to provide a device by means of which stop-cocks may be readily attached to metallic cans. The tube is split longitudinally, so as to divide the T-shaped head transversely through its center. The head is placed inside the can by putting the two parts of it together parallel with each other, with the halves of the tube extending in a straight line in opposite directions, and inserting the parts of the head into the aperture in the can and bringing the parts of the tube together. A packing ring is placed on the tube, and a stop-cock, which is threaded internally and fitted to the tube, is screwed down firmly upon the packing, thus clamping the side of the can between the head and packing ring.

IMPROVED TONGUE CLEANER.

Lazarus Morgenthau, New York city.—The object of this invention is to furnish for the use of sick and healthy people an improved tongue-cleaning device, by which the layer or film settling on the tongue may be removed in perfect and easy manner. It consists a central scraper with concaved knife edge, bush, and handles at both sides of the scraper, the sponge brush following the scraper over the tongue, and leaving the same perfectly dry and clean, as the sponge or other material absorbs the moisture and smaller particles not removed by the scraper. The sponge brush is attached to the rear edge of the scraper portion by being stitched to holes of the same, the flat sponge extending then forward to the edge of the scraper. The cleaner admits the quick and effective scraping of the tongue, so as to keep the same in clean and healthy condition, which is conducive to the preservation of the teeth when used by healthy persons, and of especial advantage for sick persons, for hospital and other uses.

IMPROVED PULLEY BLOCK.

Anton Bischoff, New York city, assignor to himself and Frederick Burger, of same place.—The invention is intended to furnish an improved pulley block for clothes lines, by which the annoying wedging in of the lines between pulley and cheek of block is fully avoided and a reliably working pulley block obtained; and the invention consists of a pulley block having cheeks with interior circular recesses fitting over the rim or flanges of the pulleys. The pulley revolves on a fixed shaft and projects, by its flanges or rims, into circular recesses at the inner side of the cheeks, which recesses extend in such a manner around the pulley that any possibility of wedging in the clothes line between block and pulley is entirely avoided.

IMPROVED OILING JOURNAL OF LOOSE PULLEYS.

Charles H. Weigle, York, Pa.—The object of this invention is to furnish a device for oiling the journals of loose pulleys while running. The invention consists in the combination of the receiver, provided with the discharge pipe and the screw cap, the piston, piston rod, and spring, the valve, fan, and spring, and the sleeve, having a right hand screw thread upon its inner surface, with each other, to adapt the device to be applied to the hub of a loose pulley. With this construction, when the pulley is revolved rapidly, the pressure of the air forces the fan back, opens the valve, and allows the oil to be forced out by the piston and spring. When the pulley ceases to revolve, the spring brings the fan to its former position, closes the valve, and prevents any more oil from being forced out.

IMPROVED BOTTLE STOPPER.

Carl E. G. Winter, Port Jervis, N. Y., assignor to himself and John G. Pfutzner, of same place.—The object of this invention is to provide a bottle stopper that may be easily applied to ordinary bottles, and that operates quickly and easily in stopping and unstopping the bottle. A lever is so contrived that when the stopper is placed in the mouth of the bottle, and the lever is brought over in fastening the stopper, it carries the yoke wire past the pivot of the lever, thereby locking the stopper, and holding the arm of the lever in contact with the side of the stopper. To release the stopper, it is only necessary to raise the longer arm of the lever until the yoke wire passes the center of the pivot of the lever, when the stopper is thrown out by pressure from within bottle.

IMPROVED FOUNTAIN PEN.

Charles A. Atkinson, New York city.—The object of this invention is to furnish a writing instrument that shall possess all the features of a good fountain pen, and yet shall contain no fluid ink, which may be carried about the person without any danger of ink leaking out and staining the clothes, which may be readily replenished with a solid coloring substance, yielding a desirable ink when brought into contact with water. The instrument may be used in two ways: First, by dipping it in water to the base of the tongue, when it yields a perfect fluid ink. When through using it, it dries in a moment, and may be immediately placed in the pocket. The second way is to use the water reservoir, which is filled until the water trickles out through the valve a drop at a time, and that very slowly. The lower end of the reservoir is then inserted in the holder and the instrument is ready for use.

IMPROVED FIRE ESCAPE AND SPRING BED BOTTOM.

Joseph Kellner, Jersey City, N. J.—This invention consists in the combination of a number of spring sections and bars with two ropes, the sections forming a bed bottom when placed in a bedstead adapted to receive them, and in case of fire form an escape that may be instantly adjusted for use. These bars are arranged longitudinally in the bedstead, and the ropes that pass through the sections lie outside the said bars. When it is desired to use the fire escape, the frame containing the sections is removed and the end that is attached to the hook is removed and carried to the window and thrown out. The sections come out of the bedstead readily; and when the whole is out of the window, descent may be readily made, as it forms a strong and complete ladder.

IMPROVED TOBACCO PACKAGE.

Auguste Villaret, New York city.—This invention is intended for the purpose of packing chewing tobacco in such a manner that a single chew may be taken at any moment, in the most convenient manner, without interfering with or exposing in the least the remaining portions, which are fully protected, and the invention consists of placing a quantity of tobacco sufficient for a chew into a wrapper or shell of paper and tinfoil, or other material, of cylindrical or other shape, and connecting a number of such small packages by telescoping one within the other, and closing the end of top package. The wrapper is make of paper or tinfoil, or both, and of cylindrical or other shape, and is of such a size as to store a small quantity of chewing tobacco sufficient for one chew, both the wrapper and tobacco being pressed into the required shape by suitable machinery. The wrappers are closed at one end and left open at the other end to be inserted or telescoped one within the other. When required for use, the lowermost package or chew is first taken off, then the next, and so on, the remaining ones being always connected and closed, so as to be carried in the pocket without getting injured or soiled. The shell or wrapper is then readily removed from the chew, and the same thus obtained for use in a more convenient manner, preserving the remaining chews in a moist and fresh state, without the annoying drying out, as in the present packages.

IMPROVED VELOCIPEDE.

James Higgins and Patrick Traynor, Westfield, N. J.—The object of this invention is to furnish an improved velocipede, which shall be simple in construction, inexpensive in manufacture, and easily propelled and guided. To the axle are attached ratchet wheels the teeth of which engage pawls attached to the wheels and held against the ratchet wheels by springs, This construction causes the axle to carry the wheels with them in their revolution. To the center of the axle is attached a gear wheel, the teeth of which mesh into the teeth of a gear wheel pivoted to the frame, and its teeth mesh into the teeth of a gear wheel pivoted to the upper end of a slotted arm or standard attached to or formed upon the forward part of the frame. To the ends of the journals of this gear wheel are attached cranks for the rider to take hold of to propel the machine.

IMPROVED PERCUSSION FUSE FOR PROJECTILES.

Max Zeroni, Witten, Germany.—This invention consists of a bolt casing with suitable retaining base plate and priming device, in connection with a sliding needle bolt that is retained during the flight of the projectile by base pins, and forced into the priming the instant resistance is offered to the projectile. A frangible lead pin secures the needle bolt to the casing, together with a detachable safety wire that retains the needle bolt in position and prevents any danger of premature explosion until it is withdrawn. The fuse is set into each prepared projectile, and the safety wire passed through the bolt casing and needle bolt, and bent over at one end, so that the safety wire cannot drop out. The safety wire supports the frangible lead pin, and affords full security during transportation. Before setting the projectile into the gun the wire is simply drawn out, and thereby the projectile is made ready for use.

IMPROVED NUT LOCK.

Silas S. Crocker and Albert Wilcox, Clarence, Iowa.—The object of this invention is to furnish an improved lock or fastening for the nuts of bolts upon railroad machinery and other machinery subject to a constant or intermittent jarring, to prevent the said nuts from working loose, and which shall be simple in construction, easily and quickly applied and removed, and reliable in use. The invention consists in the lock, made of spring brass wire, having its outer part bent to form a spiral spring, in combination with the grooves formed in the bolt and nut across their threads, as hereinafter fully described. With this construction, when the nut is screwed up and one of the grooves brought opposite the groove of the bolt, the straight part of the lock or fastener is inserted in the hole formed by the said grooves, and the spiral spring of said lock is sprung into the thread of the said bolt.

IMPROVED MORTISING CHISEL.

Jasper S. Russell, Indiana, Pa., assignor to himself and James Feath, of same place.—This invention refers to an improved mortising chisel that moves the chips as fast as they are cut, and it consists of a mortising chisel having a spring piece attached to the tongue on the bevcled shank piece of the chisel, said spring being extended forward to the cutting point of the chisel, and being pointed at the end and serrated at the under side, where it forms contact with the fluted and serrated chisel. The serrations of the spring and chisel catch and hold the chips so as to pass them back between chisel and spring by the successive strokes, until they come in contact with the beveled deflecting shank piece, which throws the chips sidewise out of the chisel.

IMPROVED SPIRAL SPRING.

James Ludlum, Pompton, N. J.—This invention consists in the peculiar form of bar used in making the spring, whereby the line of greatest resistance may be brought into any required relation to the axis of the spiral; the object being to so dispose the metal of which the spring is made as to utilize it to the fullest extent, and also to economize space. This bar, from which the spring is made, differs from a round bar in having its inner surface flattened, and having the projecting rounded corners at opposite sides of the flattened portion, and in extending the side which is opposite the flattened side. The idea of the plan on which the bar is made is to bring the vertical diametrical line of a round bar nearer the axis of the spiral. To accomplish this the natural method would be to make one side of the bar flat, and add to the diameter of the bar to compensate for the deficiency in material due to flattening the side. This plan partly accomplishes the object; but it is more effectively accomplished by rendering it almond-shaped. The transverse section of the bar has the general form of a triangle having two similar curved sides and a right base, and having all of the corners rounded.

IMPROVED FILTER PRESS.

John Bowing, Cornhill, London, Eng.—This improved filtering apparatus is constructed in the following manner: A compound filtering chamber is made, or a series of chambers, by connecting a series of rings made of wood or other suitable material, which are bound together with iron hoops. The rings thus made are mounted on rollers which run on two suspended rails, so as to admit of their being easily moved, and when in contact the rings form a horizontal cylinder. The dimensions of these rings are determined by the amount and by the physical character of the matter to be operated upon in the filter. Between each two rings is suspended or otherwise placed a plate or disk of sheet metal, not less in diameter than the outer diameter of the rings. Each disk has one or more large holes cut in it, so that any dense fluid matter can flow readily from one side of the disk to the other, or from one of the series of chambers to the other. The disks are partly covered on both sides with canvas, cloth, linen, sacking, calico, felt, matting, or such like material, the holes being left uncovered. This form of filter press is specially adapted to the treatment of very large masses or volumes of matter having very low comparative value, such as waters, sewage, cement, slurry, potter's clay, china clay, whiting, yeast, and the like. In the treatment of less bulks, or of delicate and costly bodies, such as chemicals, colors, wines, beers, sugars, and the like, the apparatus may be made of glass, porcelain, or other suitable material, and mounted in any other convenient manner.

IMPROVED HOSE COUPLING.

William H. Burden and Benjamin J. Pleasance, Cleveland, O.—Each portion of the coupling is provided with a sliding three-wing valve, of which the one in the male part is to be forced open and held in this position by the valve stem of the female portion, admitting the passage of steam or water when the parts are uncoupled. By uncoupling the parts the pressure of the water would close the parts automatically. The valves stand in opposite directions to each other, and slide against cross pins that retain the valves in one direction, the conical seats retaining them when closed, they closing when the parts are uncoupled by their own weight or pressure without allowing waste of water or steam, and providing thus a very useful automatic valve action in connection with the coupling.

IMPROVED SLED.

Charles D. Hinman, Moses Ladd, and William W. Ladd, St. Johnsbury, Vt.—This invention has reference to an improved sled for coasting purposes, the same being provided with a simple and effective brake device. The front part of the brake lever swings in a central longitudinal slot of the seat, and terminates with a button, to which the cord for pulling the sled may be attached, and which increases the weight of the front part of the brake lever, so that it overbalances the rear part, and rests on the front cross brace when not in use. When the brake is used the front part is raised, so that the rear end forms contact with the ground, the brake action being the stronger the more the lever is forced back. Thus a strong and neat sled for coasting purposes is provided, which is fully within control of the rider by the brake arrangement.

IMPROVED KETTLE COVER.

Agide J. Beaudette and Louise L. Beaudette, Fond du Lac, Wis.—This invention consists of a kettle cover, one half of which is perforated with holes of suitable size, and which is provided with a cover that is capable of turning on a central pin, so as to cover the perforations, or leave them exposed, the object being to provide a cover that will permit of turning water off from articles in the kettle without danger of losing the articles or burning the hands. The advantages claimed for this cover are that it will retain articles in the kettle while the water can be readily poured off. It also prevents the escape of the main volume of steam, thus preventing the burning of the hands. It can be used to advantage when meats are cooked, as it permits the escape of steam, but prevents the spattering of grease.

IMPROVED WAGON JACK.

Amiel Bratschi, Portersville, Pa.—The object of this invention is to furnish a wagon jack that is adapted to raise wagon axles and other objects to any height, and rigidly support the same for oiling and other purposes. The invention consists of a rigid vertical guide post, secured to a suitable base, and of a sliding post, with central groove and cross pins, raised by a hand lever with hook-shaped end. The hand lever is fulcrumed to a swinging rod, and made to engage one of the cross pins of the sliding post and lock the latter, in connection with the swinging brace rod, into raised position. By raising the hand lever the sliding post is lowered, and the hook of the hand lever disengaged from the pin. The locking of the sliding post to any required height by the joint action of the hand lever and pivot rod forms the essential feature of this jack, and furnishes a simple and effective implement for the raising of axles and similar purposes.

IMPROVED TORPEDO FOR OIL WELLS.

Araunah M. Smith, Edenburg (Knox P. O.), Pa.—The object of this invention is to improve the torpedoes or cartridges used for scattering the rock in artesian wells, for the purpose of increasing the production of oil or other mineral substances, they being so constructed that they may be handled without danger of explosion until they are at the proper point; and the invention consists of a shell, with a bail made of two parts, one part being stationary, the other working upon side pivots, to swing down for inserting or removing the hammer, with the percussion caps, without interfering with the charge of nitro-glycerin. In case the explosion does not take place for some reason or other, the torpedo has to be raised for examination. By using this torpedo it is not necessary to take the same out of the well and empty the nitro-glycerin out of the shell, which is an extremely hazardous performance; but it is stopped and made fast in the same position as when it was being filled, the swinging part of the bail is opened, the hammer removed from the shell, the caps examined or replaced with new ones, when the hammer is ready to be replaced, the bail closed, and the torpedo lowered again, to be exploded, when arriving at the bottom, by the sudden dropping of the hammer.

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Business and Personal.

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For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N.Y.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Skinner Portable Engine Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

Improved Wood-working Machinery made by Walker Bros., 73 and 75 Laurel St., Philadelphia, Pa.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st. Philadelphia, Pa.

Baxter's Adjustable Wrenches fit peculiar corners. Manuf. by Greene, Tweed & Co., 18 Park Place, N. Y.

Have you seen the Briggs Lathe? Mounted on iron stand with walnut top and 21 inch driving wheel, with 3 speeds. Price $25 complete, or $13 without stand. Frasse & Co., 62 Chatham St., N. Y.

Polishing Supplies for all kinds of Metals. Greene, Tweed & Co., 18 Park Place, N. Y.

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years constant use prove them stronger and more durable than wrought iron. See advertisement, page 238.

Emery Grinders, Emery Wheels, Best and Cheapest, Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

Notes & Queries

(1) A. L. B. asks if there is any way of making paper soluble in water? A. No.

(2) A. H. asks how to neutralize the bad effect of gas in a room where plants are kept? A. The only way will be to stop the leakage of gas, if there be any, and provide better ventilation.

(3) R. P. T. asks for a flavoring for cigars? A. Cinnamon and tonka beans may be bruised and macerated in rum and the tobacco sprinkled with the spirit. Cigars may be moistened externally with a tincture of cascarilla or of gum benzoin.

(4) W. P. P. says he is using an aniline ink with rubber stamps, but it fades, and asks if there is a remedy? A. The fading cannot be avoided where exposed to light.

(5) S. A. H. asks how to make a Leyden jar? A. An ordinary candy jar, free from cracks and flaws, will answer; line inside and out to within 4 inches of the top with tinfoil, heat so as to drive of all moisture; give the glass above the foil, inside and out, several coats of shellac varnish, and use a cork carefully fitted, dried and baked in an oven, and varnished. The chain from the brass rod and ball should be sufficiently long, and fair earth connection must be provided when charging.

(6) G. R. asks: 1. What size of wire should be used in winding the cores of an electro-magnet, and with how many layers should each core be wound, each core being 36 inches long by 3½ inches diameter? A, You may use 9 spools on each core, each spool having about 16 layers of No. 12 covered copper wire. 2. Of how many pairs, and what size, of Grove or other cells, should the battery consist? A. Use three 1 gallon jars, exposing to the liquid in each about 300 square inches of surface of zinc (six plates) opposed to an equal surface of carbon. Use for the liquid acidified solution of potassium dichromate.

(7) O. H. W. asks: 1. Will a frosted window give more or a better distributed light than a plain one of the same size? A. It aids the diffusion of light but decreases the intensity. 2. What are the best and cheapest methods of frosting windows? A. By emery grinding or by the sand blast.

(8) C. A. K. asks: 1. What effect has Paris green on the system? A. It is an irritant poison, its action on the system being very nearly that of arsenic alone. It inordinately increases the secretions and diminishes the contractility of the voluntary muscles. 2. What is the best antidote for Paris green? A. Hydrated magnesia and fresh hydrated sesquioxide of iron are well recommended, but no specific antidote is yet known. The poison is but slightly soluble, therefore no chemical antidotes should ever supersede active evacuent treatment.

(9) E. C. H. asks for a simple rule how to place the weight from the fulcrum or pin of a safety valve, to produce 50 lbs. pressure. Weight of valve being ¼ lb., area of valve ·78. Weight of beam ¾ lb.; center of gravity of beam 6 inches from pin or fulcrum. Distance from fulcrum to valve $1\frac{5}{16}$, weight 8¾ lbs. A. Multiply weight of valve by $1\frac{5}{16}$. Multiply weight of beam by 6. Subtract the sum of these products from pressure of steam multiplied 0·78 times $1\frac{5}{16}$. Divide the remainder by the weight of the ball.

(10) A. M. R. asks: 1. For a recipe for making ink suitable for use in post offices for cancelling with hand stamp? A. A fine grade of printing ink is ordinarily employed. A good ink may be made as follows: Balsam of copaiba (pure), 9 ozs.; lampblack, 3 ozs.; indigo and Prussian blue, of each, 5 drachms; Indian red, ¾ oz.; dried yellow soap, 3 ozs.; grind to a uniform smoothness. 2. How can I make a suitable pad for inking stamp? A. Cover the metal base with a smooth piece of wood and build on this the cushion—a piece of thick, dressed leather covered with several thicknesses of silk. 3. How can I purify water in a new hemlock cistern which emits a stench? A. A few bushels of recently prepared, well burnt charcoal free from dust, thrown into the water, will often suffice. If the smell is due to the resinous constituents of the wood, it may be requisite to discharge the contents several times after replacing with fresh water, until no further contamination occurs.

(11) L. B. B. asks: 1. How does a night glass differ from a common glass? A. The instrument sometimes called by seamen a night glass is composed of a convex object glass, and a concave eye lens placed at a distance equal to the difference of their focal lengths, the magnifying power being as the focal length of the object glass is to that of the eye lens. Thus, if the focal length of the object glass is 36 inches, and that of the eye lens 1 inch, they should be 35 inches apart, and the magnifying power would be 36 times. 2. Is it possible to make a binocular glass with a power of 40 diameters? A. Yes; make the focal length of the eye piece one fortieth that of the object glasses. See p. 11, SCIENTIFIC AMERICAN SUPPLEMENT, No. 1.

(12) H. F. S. asks how Japanese lacquer is made? A. Melt 50 lbs. of Naples asphaltum and 8 lbs. dark gum anime, boil for about two hours in 12 gallons linseed oil; then melt 10 lbs. of dark gum amber and boil it with two gallons linseed oil; add this to the other and add dryers. Boil for about two hours, or until the mass when cooled may be rolled into little pellets. Withdraw the heat and thin down with thirty gallons turpentine. During the boiling the mass must be constantly stirred to prevent boiling over.

(13) D. J. T. asks for a cement for an aquarium that will not crack or peel from glass or galvanized iron? A. Take, by measure, 10 parts of litharge, 10 parts of plaster of Paris, 10 parts of fine dry white sand, and 1 part finely powdered resin. When wanted for use, mix into a stiff putty with boiled linseed oil. Do not use the tank for three or four days after cemented.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

E. P. C.—It is hornblendic rock containing sulphides of iron and a little copper sulphide. The crystals are garnets.—E. T.—It is quartzite—composed of minute crystals of quartz.—G. M. L.—It is iron pyrites.—H. B. L.—The sand contains quartz, porphyry, felspar, fluorspar, lime carbonate, pyrites, and possibly a little gold.—W. R. P.—It is a piece of agate.—O. B.—It is axinite, composed of silicates of lime, alumina, iron, manganese and boron.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On What is Electricity. By J. H. R.

On Science against Homeopathy. By J. W. C.

On the Liverpool Engineering Society. By W. W.

On Aerial Navigation. By W. J. L.

Also inquiries and answers from the following:

I. B.—C. F. P.—P. McN.—J. F. & S.—H. B. L.—D. D. B.—J. R. E.—J. W. D.—J. E. M.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who publishes photographic periodicals? Who publishes books on brass founding? Who makes vulcanizing apparatus for vulcanizing india rubber?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 4, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Aerial currents, apparatus for, P. Mihan	194,782
Alarm register, Moffett & Dean	194,951
Atmospheric exhauster, A. B. Brown	194,764
Axes, machine for making, C. W. Cardot	194,892
Baker, altar bread or wafer, R. B. Daley	194,894
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Wood, preserving, I. Hayford	194,773
Wool polisher, G. Zimmer	194,947
Work stand, E. G. Gollner	194,816

DESIGNS PATENTED.

10,173 to 10,194.—CARPETS.—J. L. Folsom, Brooklyn, N. Y

10,195 to 10,203.—CARPETS.—O. Heinigke, New Utrecht, N. Y.

10,204 to 10,217.—CARPETS.—H. Horan, East Orange, N. J.

10,218.—CARPETS.—H. Nordman, New York city.

10,219 and 10,220.—CARPETS.—G. W. Piggott, New York city.

10,221 to 10,223.—CARPETS.—J. E. Rollings, New York city.

10,224.—CARPETS.—J. H. Smith, Enfield, Conn.

10,225 to 10,228.—CARPETS.—W. H. Smith, Enfield, Conn.

10,229.—CIGAR BOX.—J. Straiton & G. Storm, Bay Side, N. Y.

10,230.—EASY CHAIR.—F. Krayl, Chicago, Ill.

10,231.—PRINTED AND WOVEN FABRIC.—W. Morris, London, England.

10,232.—HANDLES FOR TABLE WARE.—J. A. Whalen, New York city.

[A copy of any one of the above patents may be had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]

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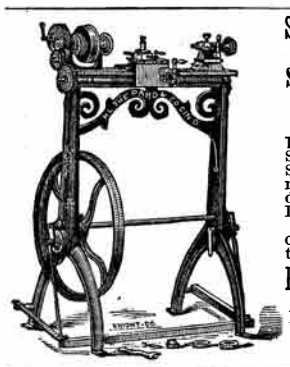

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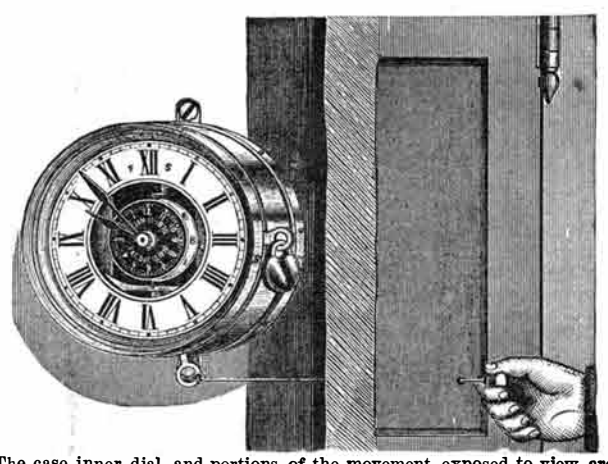

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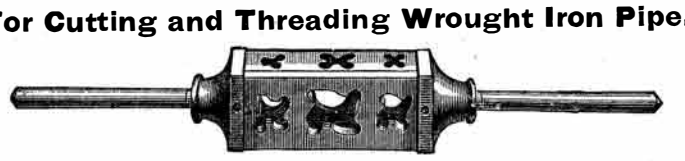

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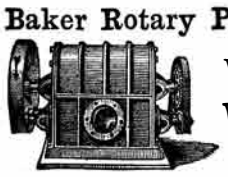

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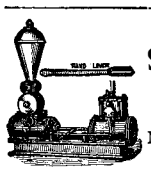

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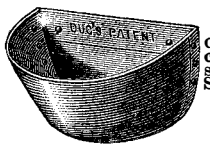

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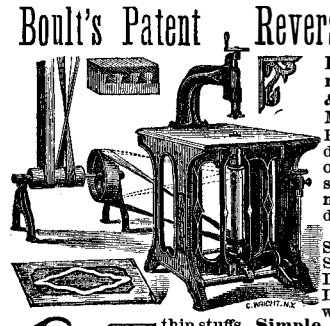

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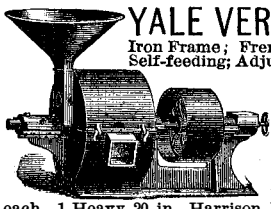

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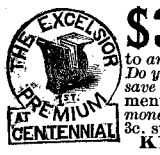

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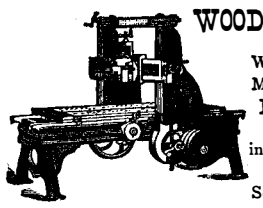

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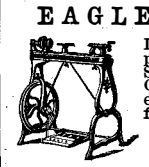

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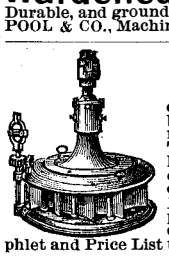

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